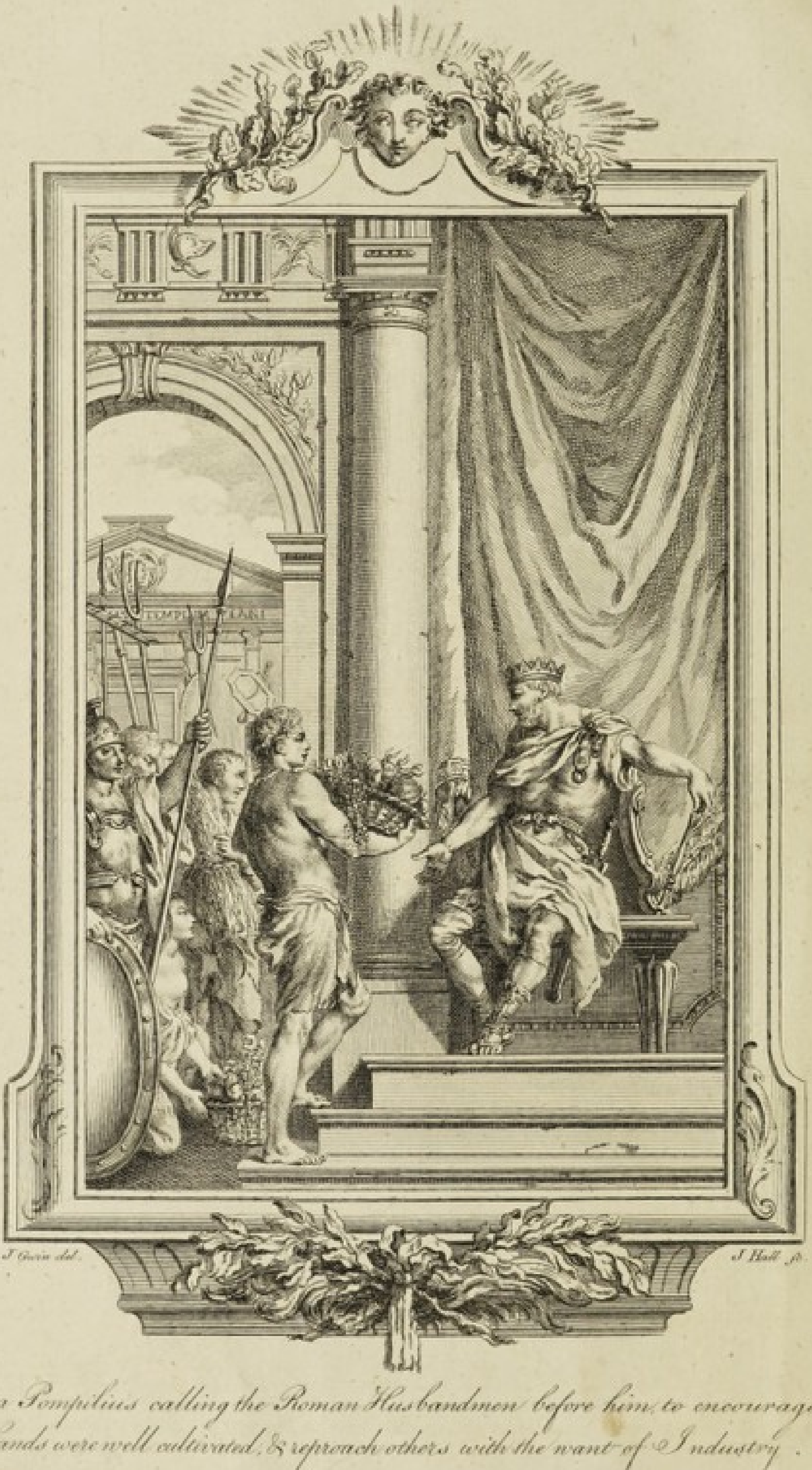
COMPLETE



J Gwin del.

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Numa Pompilius calling the Roman Husbandmen before him, to encourage those whose Lands were well cultivated, & reproach others with the want of Industry.

THE

COMPLETE FARMER:

OR, A

GENERAL DICTIONARY

OF

HUSBANDRY,

IN ALL ITS BRANCHES;

Containing the Various

Methods of Cultivating and Improving every Species of Land,

According to the PRECEPTS of both the

OLD AND NEW HUSBANDRY.

In which every Thing valuable from the beſt Writers on this Subject will be extracted, viz. LINNÆUS, CHATEAUVIEUX, the Marquis of TURBILLY, PLATT, EVELYN, WORLIDGE, MORTIMER, TULL, ELLIS, MILLER, HALE, LISLE, ROQUE, MILLS, &c.

TOGETHER WITH

A Great VARIETY of NEW DISCOVERIES and IMPROVEMENTS.

ALSO

The Whole Buſineſs of Breeding, Managing, and Fattening CATTLE of all Kinds; and the moſt approved Methods of curing the various Diſeaſes to which they are ſubject. Together with the Method of raiſing BEES, and of acquiring large Quantities of WAX and HONEY, without deſtroying thoſe laborious Inſects. Likewiſe the uſeful Parts of GARDENING; or thoſe neceſſary for the FARMER, and COUNTRY GENTLEMAN.

Illuſtrated with a great VARIETY of Folio COPPER-PLATES, finely engraved; exhibiting all the Inſtruments uſed in this neceſſary ART; particularly thoſe lately invented, and preſented to the SOCIETY for the Encouragement of ARTS, &c. in LONDON; many of which have never yet appeared in any Work of this NATURE.

By A SOCIETY of GENTLEMEN,

Members of the SOCIETY for the Encouragement of ARTS, MANUFACTURES, and COMMERCE.

LONDON: Printed for the AUTHORS;

And ſold by S. CROWDER, at the Looking-Glaſs; J. COOTE, at the King's Arms, in Paternoſter-Row; and F. BLYTHE, near the Royal Exchange.

MDCCLXVI.

TO THE

P U B L I C.

HUSBANDRY is, with great juſtice, placed at the head of human arts, as having a very great advantage over all others, both with regard to antiquity and uſefulneſs. It had its birth with the world, and has always been the genuine ſource of ſolid wealth, and real treaſures; for it will furniſh a people with every thing neceſſary to render life happy and deſirable, form the principal revenues of the ſtate, and even ſupply the defect of all others, when they happen to fail.

It is therefore no wonder that the wiſeſt princes, and the moſt able miniſters, among the ancients, made it their principal ſtudy to encourage and improve the Art of Huſbandry: they well knew that the ſtrength of a ſtate ſhould not be eſtimated by the extent of its territories, but by the number of its inhabitants, and the utility of their labours. And it ſhould be remembered, that ſome of the moſt noble conſuls and dictators among the ancient Romans were taken from the Plow, and that the ſenators of that flouriſhing people ſpent the greater part of their time in the country, where they tilled their fields with their own hands. "In thoſe happy times, ſays Pliny, the earth, pleaſed at ſeeing herſelf cultivated by the hands of triumphant victors, ſeemed to make ſtronger efforts, and to produce her fruits in greater abundance." Doubtleſs becauſe they applied themſelves to the taſk with greater attention, and took the wiſeſt precautions to render their labours ſucceſsful: for when men of genius and abilities apply themſelves to any art, they ſoon make very great improvements, and advance it to a much higher degree of perfection: while the common people, by ſervilely confining themſelves to the common mode of practice, never make any farther progreſs in their profeſſion.

But when deſtructive luxury was introduced among the old Romans, Huſbandry declined, and has never ſince reached the honourable ſtation it before poſſeſſed: owing, in a great meaſure, to an opinion founded on falſehood, namely, that the Practice of Huſbandry requires neither ſtudy, reflection, nor precepts; and is therefore beneath the notice of men of fortune and genius. The ancients, however, thought very differently: they were perſuaded, that, in order to cultivate Lands to advantage, it was neceſſary to ſtudy the works of thoſe who had written on this ſubject, and to add the experience of others to their own. This opinion is now once more happily eſtabliſhed; and the Study of Huſbandry purſued with ſuch aſſiduity in different of Europe, that an amazing number of the moſt important diſcoveries have been lately made in that uſeful and neceſſary branch of knowledge.

But theſe uſeful Diſcoveries and Improvements are ſcattered through a multitude of volumes, written in different languages, and publiſhed in different countries; ſo that they can only be known to thoſe who have abilities to purchaſe, and leiſure ſufficient to peruſe ſo great a variety of books.

The

The Authors of this Undertaking were therefore perſuaded, that the Public would very willingly encourage a work in which the Theory and Practice of every branch of Huſbandry were delivered in the plaineſt and moſt intelligent manner, and enriched with all the Diſcoveries hitherto made in any part of Europe. This laborious taſk they have accordingly undertaken, and will venture to promiſe the Reader, that he will find in this Dictionary all the valuable Precepts, Obſervations, Diſcoveries, and Improvements, contained in the writings of *Linnæus*, *Barck*, *Tarello*, *Duhamel*, *Chateauvieux*, *De Lille*, the Marquis of *Turbilly*, *Platt*, *Sharrock*, *Evelyn*, *Houghton*, *Worlidge*, *Stillingfleet*, *Mortimer*, *Tull*, *Ellis*, *Miller*, *Hale*, *Liſle*, *Mills*, and ſeveral other Authors; together with thoſe publiſhed by the Societies of *Berne*, *Lions*, *Tours*, *Paris*, *Rouen*, *Edinburgh*, *Dublin*, and *London*.

And they hope it will be remembered, that this is the Firſt Attempt to give a COMPLETE SYSTEM of every branch of Huſbandry, and to blend in One Work the various Diſcoveries made in different nations. They alſo hope that the pains they have taken to inſert every thing belonging to the ſame ſubject in one article, and to range the whole in alphabetical order, will be approved of by their Subſcribers, as it evidently tends to facilitate the Study of Huſbandry, by enabling the Reader to find, with the greateſt eaſe and expedition, whatever ſubject he may be deſirous of conſidering; which cannot fail of being very ſerviceable to the public, it being the general complaint, that in all the books of Huſbandry, though they contain very valuable materials ſcattered throughout, it requires much time and trouble to diſcover them.

The great number of large COPPER-PLATES, with which this Dictionary will be illuſtrated, muſt prove a very valuable addition, and render it far ſuperior to any treatiſe of this kind ever yet offered to the world; as it is impoſſible to convey an adequate idea of the various inſtruments, lately invented or improved for facilitating the practice of Huſbandry, without the aſſiſtance of large and accurate drawings. This has, however, rendered the work far more expenſive to the Proprietors; but being determined to make it as complete as poſſible, they have ſpared nothing in their power to ſucceed; and flatter themſelves with receiving proportionable encouragement from the Public.

THE

THE COMPLETE FARMER: OR, A GENERAL DICTIONARY OF HUSBANDRY.

ABELE-TREE, a ſpecies of poplar, growing naturally in all the temperate parts of Europe, and called by botaniſts *populus foliis lobatis dentatis ſubus tomentoſis*.

The leaves of the abele-tree are large, and divided into three, four, or five lobes, which are indented on their edges, of a very dark colour on their upper ſide, but very white and downy on their under, ſtanding upon foot-ſtalks about an inch long. The young branches have a purple bark, and are covered with a white down; but the bark of the ſtem and older branch is grey. In the beginning of April, the male flowers or catkins appear, which are cylindrical, ſcaly, and about three inches long: about a week after come out the female flowers, or catkins, which have no ſtamina like thoſe of the male. Soon after theſe come out, the male catkins fall off, and in five or ſix weeks after, the female flowers will have ripe ſeeds incloſed in a hairy covering; then the catkins will drop, and the ſeeds will be wafted by the winds a great diſtance. This tree is often confounded with the white poplar; but they are in reality diſtinct ſpecies.

The abele-tree may be propagated either by layers or cuttings, which will readily take root, or by ſuckers, which they ſend up from their roots in great plenty. The beſt time for tranſplanting theſe ſuckers is in October, when their leaves begin to decay. Theſe may be placed in a nurſery for two or three years to get ſtrength, before they are planted out where they are deſigned to remain; but if they are propagated from cuttings, it is better to defer the work till February, at which time truncheons of two or three feet long ſhould be thruſt about a foot and a half into the ground. Theſe will readily take root, and if the ſoil, in which they are planted, be moiſt, will arrive to a conſiderable bulk in a few years.

A conſiderable advantage may be made by planting theſe trees upon boggy ſoils, where few other trees will thrive. Many ſuch places there are in England, which do not at preſent bring in much money to their owners; whereas, if they were planted with theſe trees, they would, in a very few years, be of more value than the ground, clear of all expences; but there are many perſons, who think nothing, except corn, worth cultivating in England; or, if they plant timber, it muſt be oak, aſh, or elm; and if their land be not proper for either of theſe, it is conſidered as of little value: whereas, if the nature of the ſoil was examined, and proper ſorts of plants adapted to it, there might be very great advantages made of ſeveral large tracts of land, which at this time lie neglected.

The wood of the abele-tree is very good for floors, where it will laſt many years, and for its exceeding whiteneſs is, by many perſons, preferred to oak; but, being of a ſoft nature, is very ſubject to take the impreſſions of nails, &c. which renders it leſs proper for this purpoſe. It is alſo very good for wainſcoting rooms, being leſs ſubject to ſwell or ſhrink than moſt other woods; but for turnery-ware there is no wood equal to this for its exceeding whiteneſs, ſo that trays, bowls, and many other utenſils are made of it; the bellows-makers alſo prefer it for their uſe, as do alſo the ſhoemakers for heels of ſhoes; it is likewiſe very good to make light carts, and the poles are very proper to ſupport hops, vines, &c. and the lopping will afford good fuel, which in many countries is much wanted. *Miller's Dict.*

The abele-tree is very proper for planting where you deſire a ſpeedy ſhelter and walks, it often making ſhoots of eighteen or twenty feet long in a year. *Mortimer's Huſbandry.*

ABLACTATION, a term formerly uſed for a particular method of grafting, called by modern gardeners, inarching, or grafting by approach. *See* GRAFTING *by approach.*

ABLAQUEATION, the removing the earth, and laying bare the roots of fruit trees in winter, that they may be the more readily expoſed to the influence of rains, ſnow, air, &c. an operation formerly thought neceſſary for their future welfare; but experience has ſhewn it to be a dangerous practice, eſpecially where the trees are much expoſed to the winds, particularly the ſouth-weſt, which are generally the moſt violent. The practice of ablaqueation is therefore with very good reaſon laid aſide in the preſent practice.

ABORTIVE CORN, a diftemper of corn mentioned by Mr. Tillet, in a differtation which gained the prize at the academy of Bourdeaux.

This diftemper, fays that ingenious naturalift, fhews itfelf long before harveft, when the ftalk is not above eighteen inches high; and may be known by a deformity of the ftalk, the leaves, the ear, and even the grain.

The ftem of abortive corn is generally fhorter than that of other plants of the fame age; it is crooked, knotted, and rickety; the leaves are commonly of a bluifh green colour, curled up in various forms; fometimes turned like wafer cakes, and often rolled in a fpiral form. The ears have very little of their natural form; they are lean, withered, and fhew very imperfect rudiments, either of the chaff or grain.

All thefe fymptoms are however only to be found in plants that are in the height of the diftemper. The ftalks are often pretty ftrait, the leaves but little curled, and the chaff tolerably well formed; but inftead of enclofing a fmall embryo, white and foft at the fummit, it contains only a green kernel, terminating in a point, not unlike a young pea when forming in its pod.

Thefe abortive kernels have two or three points very vifible; they are then fafhioned as if two or three kernels were joined together at the bafe. When thefe kernels are ripe, or rather when they are dried up, they grow black, and fo greatly refemble the feeds of cockle, that hufbandmen, who are not acquainted with this diftemper, often confound abortive wheat with the feeds of that weed.

This diftemper M. Tillet fufpects to be occafioned by infects; for he perceived on the fickly plants fmall drops of a very limpid liquor, which he judged to be extravafated fap.

ACORNS, the fruit of the oak, and too well known to need any defcription. *See* OAK.

Acorns are faid to have been the primitive food of mankind; but at prefent they are principally ufed in fattening hogs, for which they are very proper.

Some care is, however, neceffary to be taken when hogs feed upon acorns, for otherwife they will be fubject to a diftemper, called the garget. To prevent which, the beft way is to moiften fome peafe or beans with water, and fprinkle over it fome antimony pounded and fifted; if this be repeated every other day for a fortnight or three weeks, it will effectually preferve them from the diforder. Or if the acorns be collected and prepared in the following manner, they may be given to hogs without any danger.

Dig a hole in the ground in a warm place, large enough to contain feveral bufhels of acorns; in this let the acorns be put, and well moiftened with water, in which a handful or two of common falt has been diffolved: in a few days they will begin to heat and fpire; obferve them therefore attentively, and when they have made a fhoot about three inches long, take them out of the hole, and fpread them to dry on a barn floor, and in a day or two they will be fit to be given to the hogs. This matter muft, however, be managed with care and caution; they muft not have too many given at a time; at firft twice a day is often enough to feed them for a day or two; afterwards three times a day. Nor fhould they, while they eat this food, be confined to a ftye, but fuffered to run at large; for if their liberty be too much abridged, they will never thrive well, or grow fat on acorns.

It is no uncommon thing in Hertfordfhire, with the management above directed, and the affiftance of a little wafh, and a few grains now and then, for a farmer to kill feveral hogs in a feafon, which fhall weigh from eight to ten fcore, and fometimes even more.

Thefe hogs make very good meat, but it is not fo fine as when the hogs are taken up, and four or five bufhels of peafe or barley meal given to each, to complete their fattening before they are killed. *Mufeum Rufticum, vol.* I. *p.* 475.

ACRE, a fuperficial meafure of land, containing, according to the ftatute, one hundred and fixty fquare poles or perches, of fixteen feet and a half each.

But this meafure does not prevail in all parts of England; for though one hundred and fixty fquare poles or perches are allowed to be an acre, yet the length of the pole varies in different counties, and is generally called cuftomary meafure.

Thus the cuftomary perch in Staffordfhire is twenty-four feet. In the foreft of Sherwood twenty-one. In Herefordfhire the perch of walling is fixteen feet and a half; but a perch for digging twenty-one feet.

Old farmers alfo eftimate the acre of land by the proportion of feed ufed in fowing it; by which means it muft vary in proportion to the fertility or barrennefs of the foil; and hence in many counties of England they have two forts of acres, diftinguifhed by feed-acres and ftatute-acres.

The French acre, or arpent, according to Mr. Greaves's calculation, confifts of 100 perches of twenty-two feet each, amounting to 48,400 fquare French feet, which are equal to 51,691 fquare Englifh feet, or very near one acre, and three quarters of a rood, Englifh meafure.

The Irifh acre is to the Englifh, as 196 to 121. For the number of poles in each are the fame; but the Irifh pole is twenty-one feet, whereas the Englifh contains only fixteen feet and a half; and the Welch acre is equal to two Englifh ftatute acres.

ACREME, a quantity of land, confifting of ten acres.

ADDERS-TONGUE, a weed growing in low moift meadows, where it is commonly hid among the grafs.

From a very low ftalk arifes a fingle, thick, fmooth, oblong leaf, from the bottom of which iffues a kind of tongue, ending in a point, and indented on each fide like a file.

ADZE, a kind of crooked axe ufed by carpenters, fhipwrights, coopers, &c.

AFTERMATH, the fecond crop, or grafs which fprings up after mowing, or the grafs cut after the corn.

In the neighbourhood of London, the aftermath when made into hay, is of confiderable value: but in haying this crop, fo as to make it fell well, great nicety is requifite; the nature of the aftermath-grafs being more foft, fpongy, and porous, than the firft growth, and therefore more liable to be hurt by rains. *See* HAY.

AGE *of a horfe.* This is eafily known by his mouth till he comes eight, after which the ufual marks wear out. A horfe, like many other brute animals, has his teeth divided into three ranks, viz. his fore-teeth, which are flat and fmooth, his tufhes, and his back-teeth. His back teeth, or jaw-teeth, are called his grinders, being thofe by which a horfe chews and grinds his provender, and are twenty-four in number, twelve above, and twelve below: they are ftrong double teeth with fharp edges; but when a horfe grows old, they wear much fmoother.

The firft that grows are his foal teeth, which begin to appear a few months after he is foaled: they are twelve in number, fix above, and fix below; and are eafily diftinguifhed from the teeth that come afterwards, by their fmallnefs and whitenefs, not unlike the fore-teeth of a man.

When the colt is about two years and a half old, he cafts the four middlemoft of his foal teeth, viz. two above, and two below; but fome do not caft any of their foal teeth till they are near three years old. The new teeth are eafily diftinguifhed from the foal teeth, being much ftronger, and always twice their fize, and are called the nippers or gatherers, being thofe by which a horfe nips off the grafs, when he is feeding abroad in the fields, or, in the houfe, gathers his hay from the rack. When a horfe has got thefe four teeth complete, he is reckoned three years old.

When he is about three and a half, or in the fpring before he is four years old, he cafts out four more of his foal teeth, viz. two above, and two below, one on each fide the nippers, or middle teeth: fo that when you look into a horfe's mouth, and fee the two middle teeth full grown, and none of the foal teeth, except the common teeth remaining, you may conclude he is four that year, about April or May. Some indeed are later colts, but that makes little alteration in the mouth.

The tufhes appear near the fame time with the four laft mentioned teeth, fometimes fooner than thefe, and fome-ſometimes not till after a horſe is full four years old: they are curved like the tuſhes of other beaſts, only in a young horſe they have a ſharp edge all round the top, and on both ſides, the inſide being ſomewhat grooved and flattiſh, inclined to a hollowneſs.

When a horſe's tuſhes do not appear for ſome time after the foal teeth are caſt out, and the new ones come in their room, it is generally owing to their foal teeth having been pulled out before their time, by the breeders or other dealers in horſes, to make a colt of three years old appear like one of four, that he may be the more ſaleable; for when any of the foal teeth have been pulled out, the others ſoon come in their place; but the tuſhes having none that go before them, can never make their appearance till their proper time, viz. when a horſe is about four, or coming four; and therefore one of the fureſt marks to know a four year old horſe, is by his tuſhes, which are then very ſmall, and ſharp on the top and edges.

When a horſe comes five, or rather in the ſpring before he is five, the corner teeth begin to appear, and at firſt but juſt equal with the gums, being filled with fleſh in the middle. The tuſhes are alſo by this time grown to a more diſtinct ſize, though not very large: they likewiſe continue rough and ſharp on the top and edges. But the corner teeth are now moſt to be remarked; they differ from the middle teeth in being more fleſhy on the inſide, and the gums generally look rawiſh upon their firſt ſhooting out, whereas the others do not appear diſcoloured. The middle teeth arrive at their full growth in leſs than three weeks, but the corner teeth grow leiſurely, and are ſeldom much above the gums till a horſe is full five: they differ alſo from the other fore-teeth in this, that they ſomewhat reſemble a ſhell; and thence are called the ſhell teeth, becauſe they environ the fleſh in the middle half way round; and as they grow, the fleſh within diſappears, leaving a diſtinct hollowneſs and openneſs on the inſide. When a horſe is full five, theſe teeth are generally about the thickneſs of a crown piece above the gums. From five to five and a half they will grow about a quarter of an inch high, or more; and when a horſe is full ſix, they will be near half an inch, and in ſome large horſes a full half inch above the gums.

The corner teeth in the upper jaw fall out before thoſe in the under, ſo that the upper corner teeth are ſeen before thoſe below; on the contrary, the tuſhes in the under gums come out before thoſe in the upper.

When a horſe is full ſix years old, the hollowneſs on the inſide begins viſibly to fill up, and that which was at firſt fleſhy grows into a browniſh ſpot, not unlike the eye of a dried garden bean, and continues ſo till he is ſeven; with this difference only, that the tooth is more filled up, and the mark, or ſpot, becomes faint, and of a lighter colour. At eight the mark in moſt horſes is quite worn out, though ſome retain the veſtiges of it a long time; and thoſe who have not had a good deal of experience, may ſometimes be deceived by taking a horſe of nine or ten years old for one of eight. It is at this time only, when a horſe is paſt mark, that one can eaſily err in knowing the age of a horſe; for what practices are uſed to make a very young horſe or colt appear older than he is, by pulling out the foal teeth before their time, may be diſcovered by feeling along the edges where the tuſhes grow, for they may be felt in the gums before the corner teeth are put forth; whereas, if the corner teeth come in ſome months before the tuſhes riſe in the gums, we may reaſonably ſuſpect that the foal teeth have been pulled out at three years old.

It will, perhaps, be needleſs to mention the tricks that are uſed to make a falſe mark in a horſe's mouth, by hollowing the tooth with a graver, and burning a mark with a ſmall hot iron; becauſe thoſe who are acquainted with the true marks, will eaſily diſcover the cheat by the ſize and colour of the teeth, by the roundneſs and bluntneſs of the tuſhes, by the colour of the falſe mark, which is generally blacker, and more impreſſed than the true mark, and by many other viſible tokens, which denote the advanced age of a horſe.

After the horſe has paſſed his eighth year, and ſometimes at ſeven, nothing certain can be known by the mouth. It muſt, however, be remembered, that ſome horſes have but indifferent mouths when they are young, and ſoon loſe their mark; others have their mouths good for a long time, their teeth being white, even, and regular, till they are ſixteen years old and upwards, together with many other marks of freſhneſs and vigour; but when a horſe comes to be very old, it may be diſcovered by ſeveral indications, the conſtant attendants of age, viz. his gums wear away inſenſibly, leaving his teeth long and naked at their roots: the teeth alſo grow yellow, and ſometimes browniſh. The bars of the mouth, which in a young horſe are always fleſhy, and form ſo many diſtinct ridges, are, in an old horſe, lean, dry, and ſmooth, with little or no riſing. The eye-pits in a young horſe (except thoſe come of old ſtallions) are generally filled up with fleſh, look plump and ſmooth; whereas, in an old horſe, they are ſunk and hollow, and make him look ghaſtly, and with a melancholy aſpect. There are alſo other marks which diſcover a horſe to be very old, viz. grey horſes turn white, and many of them all over flea-bitten, except about their joints. This, however, happens ſometimes later, and ſometimes ſooner, according to the variety of colour and conſtitution. Black horſes are apt to grow grey over their eye-brows, and very often over a good part of their face, eſpecially thoſe who have a ſtar or blaze fringed round with grey when they are young. All horſes, when very old, ſink more or leſs in their backs, and ſome horſes, that are naturally long backed, grow ſo hollow with age, that it is ſcarce poſſible to fit them with a ſaddle. Of this kind are ſeveral Spaniſh and Barbary horſes, and many of the Daniſh and Flanders breed. Their joints alſo grow ſo ſtiff with old age, and their knees and hocks bend ſo, that they are apt to trip and ſtumble upon the leaſt deſcent, though the way be ſmooth, and no ways rugged. After which they can be of little uſe to the owner. *Gibſon on Horſes.*

Age *of neat cattle*, viz. *the ox, cow, and bull.* The age of theſe animals is known by the teeth and horns. At the end of ten months they ſhed their firſt fore-teeth, which are replaced by others, larger, but not ſo white; and in three years all the inciſive teeth are renewed. Theſe teeth are at firſt equal, long, and pretty white; but as the creatures advance in years, they wear, become unequal, and black. They alſo ſhed their horns at the end of three years; and theſe alſo are replaced by other horns, which like the ſecond teeth continue. The manner of the growth of theſe horns is not uniform, nor the ſhooting of them equal. The firſt year, that is the fourth year of the creatures age, two ſmall pointed horns make their appearance, neatly formed, ſmooth, and towards the head terminated by a kind of button. The following year this button moves from the head, being impelled by a horny cylinder, which lengthening in the ſame manner, is alſo terminated by another button, and ſo on; for the horns continue growing as long as the creature lives. Theſe buttons become annular joints, which are eaſily diſtinguiſhed in the horn, and by which the age of the creature may be eaſily known; counting three years for the point of the horn, and one for each of the joints. *Buffon's Hiſtoire Naturelle, tom.* IV.

Age *of ſheep.* Theſe animals in their ſecond year have two broad teeth; in their third year they have four broad teeth before; in their fourth year ſix broad teeth, and in their fifth year eight broad teeth. After which none can tell how old a ſheep is while their teeth remain, except by being worn down. *Ellis on Sheep.*

At the end of one year, rams, ſheep, and weathers, loſe the two fore-teeth of the lower jaw; and they are known to want the inciſive teeth in the upper jaw. At eighteen months the two teeth joining to the former, alſo fall out; and at three years, being all replaced, they are even and pretty white. But as the creature advances in age, they become looſe, blunt, and afterwards black. The age of the ram, and all horned ſheep, may alſo be known by their horns, which ſhew themſelves in their very firſt year, and often at the birth, and continue to grow a ring annually to the laſt period of the creature's life. *Buffon's Hiſtoire Naturelle, tom.* V.

AGE *of goats*. The age of goats is known by the fame tokens as thofe of the fheep, viz. by their teeth, and the annular rings on their horns.

AGRICULTURE, the art of tilling, manuring, and cultivating the earth, in order to render it fertile.

This art claims the precedency of all others in point of antiquity, it having been the fole employment of our firft parents in the delightful garden of Eden.

Adam inftructed his children in this neceffary art, both by precepts and example; and we are told by the facred hiftorian, that Cain applied himfelf to hufbandry, while Abel led the life of a fhepherd, and contented himfelf with feeding his flocks.

After the deluge the defcendants of Noah carried with them the art of hufbandry, and eftablifhed it in the various countries where they fettled. It was, however, very fimple in thefe early ages, and its advances towards perfection flow and almoft imperceptible.

Abraham, and the reft of the patriarchs, who had no fixed refidence, applied themfelves to a paftoral life, ennobling, by their example, a profeffion, which has now for many ages loft its original dignity, from its being practifed only by the meaner fort of people. But as foon as their defcendants were fixed in Paleftine, they all became hufbandmen, from the chief of the tribe of Judah, to the loweft branch of the family of Benjamin: birth at that time made no diftinction, and agriculture was confidered as a very honourable employment.

The Chaldeans, who inhabited the countries where agriculture had its birth, carried that valuable art to a confiderable degree of perfection: they cultivated their lands with great affiduity, and enjoyed the pleafing fatisfaction of receiving from their fields a very plentiful harveft. The Egyptians, who from the fertility of their country, caufed by the annual overflowings of the Nile, raifed prodigious quantities of corn, were fo fenfible of the bleffings refulting from agriculture, that they afcribed the invention of it to Ofiris; and even carried their fuperftitious gratitude fo far, as to worfhip thofe animals that laboured in tilling the ground.

The Phœnicians, fo well known in the facred writings by the name of Philiftines, were alfo famous for their fkill in agriculture; but finding themfelves too much confined in their native country by the conquefts of the Ifraelites, they fpread themfelves through the greater part of the iflands of the Mediterranean, and carried with them their knowledge in hufbandry.

The Carthaginians followed the tafte of their anceftors, and applied themfelves affiduoufly to the ftudy of agriculture. Mago, their famous general, wrote no lefs than twenty-eight books on that fubject, and which Columella tells us, were tranflated into Latin by an exprefs decree of the Roman fenate. Servius adds, that Virgil ufed thefe books as a model when he wrote his Georgics.

The ancients tell us, that the goddefs Ceres was born in Sicily, where fhe invented the art of fowing corn, and the tillage of land. The meaning of this fable is very evident; that ifland was very fruitful in corn, and agriculture was there efteemed fo honourable an employment, that even their kings did not difdain to practife it with their own hands.

But time, which at firft gave birth to arts, often caufed them alfo to be forgotten, when they were removed from the place of their origin. The children of Noah, who fettled in Europe, doubtlefs carried with them the knowledge of agriculture; but their defcendants, who took poffeffion of Greece, were fuch a favage race, that they fed on herbs, after the manner of beafts. Pelafgus taught them the culture of the oak, and the ufe of acorns as food, for which divine honours were paid him.

The Athenians, who were the firft that received any tincture of politenefs, taught the ufe of corn to the reft of the Greeks; they alfo taught them the manner of cultivating the ground, and preparing it for the feed. The Greeks foon perceived that bread was more wholefome, and its tafte more delicate than acorns; and accordingly thanked the gods for fuch an unexpected and beneficial prefent. After this the Athenian kings thinking it more glorious to govern a fmall ftate wifely, than to aggrandize themfelves by foreign conquefts, withdrew their fubjects from war, and employed them folely in cultivating the earth. This conftant application carried agriculture to a confiderable degree of perfection, and foon reduced it into an art.

Hefiod, who is generally thought to have been cotemporary with Homer, was the firft among the Greeks who wrote on this fubject. He calls his poem, "Works and Days;" becaufe agriculture requires exact obfervations of times and feafons.

The other eminent Greek writers upon agriculture, are Democritus of Abdera, Socraticus, Xenophon, Tarentinus, Architas, Ariftotle, and Theophraftus, from whom the art received confiderable improvements; as alfo from Hieron, Epicharmus, Philometor, and Attalus.

The old Romans efteemed agriculture fo honourable an employment, that in the earlieft times of the republic, the higheft praife that could be given a man, was to fay of him, that he cultivated well his own fpot of ground. The moft illuftrious fenators applied themfelves to this profeffion; nor had they either fplendor or majefty, but when they appeared in public. And their greateft generals at their return from the toils of war, from taking of cities, and fubduing of nations, were impatient till they were again employed in cultivating their lands, and thought it no difgrace to follow the plough, though they were at the fame time prepared to ferve the wants of the republic, attend her councils, or put themfelves at the head of her armies.

It muft indeed be allowed, that when the Romans became tainted with the luxury of Afia, they gradually loft the noble fimplicity of their anceftors, and employed their flaves in the feverer labours of a country life. But though they did not themfelves hold the plough, yet even men of confular dignity looked upon it as a reward for their public fervices, when they obtained leave to retire into the country, and were equally refpected when overlooking their farms, as when feated in the chair of magiftracy. M. Cato, the cenfor, that illuftrious Roman general, orator, politician, and lawyer, after having governed provinces, and fubdued nations, did not think it below his ftation to write a large treatife on agriculture.

This work, according to Servius, was dedicated to his own fon, and was the firft Latin treatife on that fubject. This work has been handed down to us in all its purity, in the fame manner as Cato wrote it. Varro compofed a treatife on the fame fubject, and on a more regular plan. This work is embellifhed with all the Greek and Latin erudition of that learned author. Agriculture alfo received great improvements from the two Safernaes, and likewife from Scorfa, Tremellius, and M. Terentius. Virgil has adorned it with the language of the mufes, and given it majefty by his verfe. He has finely embellifhed the precepts of hufbandry left by Hefiod and Mago.

Columella, who flourifhed in the reign of the emperor Claudius, wrote twelve books on hufbandry. He was a native of Bœtica in Spain, and had devoted his time to the ftudy of hufbandry.

From this time till the reign of Conftantine IV. hufbandry continued in a declining ftate, when that wife emperor caufed a large collection of the moft ufeful precepts relating to agriculture to be extracted from the beft writers, and publifhed under the title of Geoponics. Some fay he made this collection with his own hand. Nor is this at all improbable, as it is well known, that after he had conquered the Saracens and Arabians, he not only practifed, but ftudied the arts of peace, fixing his chief attention on the advancement of hufbandry.

But from the time of Conftantine IV. till about the year 1478, agriculture lay in a kind of dormant ftate, when Crefcenzio publifhed an excellent performance on agriculture at Florence. He was foon followed by feveral of his countrymen, among whom Tatti, Stefano, Auguftino Gallo, Sanfovino, Lauro, and Tarello, deferve particular honour.

In the mean time Fitz-Herbert, judge of the Common Pleas, fhone with unrivalled luftre in in the practical parts of hufbandry. He publifhed two treatifes on this fubject; the firft, which was entitled, The Book of Hufbandry, appeared 1534, and the fecond, called, The Book of Surveying and Improvements, in 1539.

Fitz-Herbert's books of agriculture foon raifed a fpirit of emulation in his countrymen, and many treatifes of the fame kind fucceffively appeared; but time has deprived us of many of thofe writings, or at leaft they are become fo very fcarce, as only to be found in the libraries of the curious.

About the year 1600, France made fome confiderable efforts to revive hufbandry, as appears from feveral large works, particularly *Les Moyens de devenir Riche*, and the *Cofmopolite*, by Barnard de Paliffy, a poor potter; *Le Theatre d'Agriculture*, by de Serres; *L'Agriculture, & Maifon Ruftique*, by Meffrs. Etienne and Liebault, &c.

The Flemings, about the fame period, dealt more in the practice of hufbandry, than in publifhing books on the fubject; fo that their intention doubtlefs was to carry on a private lucrative trade, without inftructing their neighbours: and hence it happened, that whoever was defirous of copying their method of agriculture, was obliged to travel into their country, and make his own remarks. Their principal, and indeed juft, idea of hufbandry confifted in this, namely, to make a farm refemble a garden as near as poffible. Such an excellent principle at firft fetting out led them of courfe to undertake the culture of fmall eftates only, which they kept free from weeds, continually turning the ground, and manuring it plentifully and judicioufly.

When they had by this method brought the foil to a proper degree of cleanlinefs, health, and fweetnefs, they ventured chiefly upon the culture of the more delicate graffes, as the fureft means of acquiring wealth in hufbandry upon a fmall eftate, without the expence of keeping many draught horfes or fervants.

A few years experience was abundantly fufficient to convince them, that ten acres of the beft vegetables for feeding cattle, properly cultivated, would maintain a larger ftock of grazing animals, than forty acres of common farm grafs. They alfo found that the beft vegetables for this purpofe, were lucerne, faintfoin, trefoil of moft denominations, fweet fenugreek, buck and cow-wheat, field turnips, and fpurrey.

The political fecret of their hufbandry therefore confifted in letting farms on improvement. They alfo difcovered eight or ten new forts of manure. They were the firft among the moderns who ploughed in living crops for the fake of fertilifing the earth, and confined their fheep, at night, in large fheds built on purpofe, whofe floors were covered with fand or virgin earth, &c. which the fhepherd carted away every morning to the compoft dunghill.

Our fatal domeftic wars, during the reign of Charles I. changed the inftruments of hufbandry into martial weapons; but after the death of that unfortunate monarch, artful and avaricious men crept into the confifcated eftates of the nobility, gentry, and clergy; and as many of thefe new encroachers had rifen from the plough, fo they returned with pleafure to their old profeffion, being chiefly animated by the love of gain. Plattes, Hartlib, Blythe, and others, feized this favourable difpofition of the common people, and encouraged it by writings which have fince had few equals; nor was Cromwell wanting to lend his affiftance.

Sir Hugh Platt was one of the moft ingenious hufbandmen of the age in which he lived; yet fo great was his modefty, that all his works, except his Paradife of Flora, feem to be pofthumous. He held a correfpondence with all the lovers of agriculture and gardening in England; and fuch was the juftice and modefty of his temper, that he always named the author of every difcovery communicated to him. Perhaps no man, in any age, difcovered, or, at leaft, brought into ufe fo many new forts of manure. Witnefs his account of the compoft and covered dunghill, and his obfervations on the fertilifing qualities lodged in falt, ftreet-dirt, and the fullage of ftreets in great cities, clay, fuller's earth, moorifh earth, dunghills made in layers, fern, hair, calcination of all vegetables, malt-duft, willow-tree earth, foap-boilers afhes, marle, and broken pilchards.

Gabriel Plattes may be efteemed an original genius in hufbandry. He began his obfervations in the time of queen Elizabeth, and continued them through the reigns of James I. Charles I. and during the firft three or four years of the common-wealth. But notwithftanding the great merit of this writer, the public fuffered him to ftarve and perifh in the ftreets of London; nor had he a fhirt upon his back when he died.

Samuel Hartlib, a celebrated writer on hufbandry in the laft century, was highly beloved and efteemed by Milton and other great men of that time. In his preface to a work commonly called his Legacy, he laments that no public director of hufbandry was eftablifhed in England by authority; and that we had not adopted the Flemifh method of letting farms upon improvement. This remark of Hartlib procured him a penfion of one hundred pounds a year from Cromwell; and the writer afterwards, the better to fulfil the intention of his benefactor, procured Dr. Beati's excellent annotations on the Legacy, with other valuable pieces from his numerous correfpondents.

About the time when this author flourifhed feems to have been an æra when the Englifh hufbandry rofe to great perfection; for the preceding wars had made the country gentry poor, and, in confequence thereof, induftrious. They found the cultivation of their own lands to be the moft profitable poft they could occupy. But a few years after, when the reftoration took place, all this induftry and knowledge were exchanged for diffipation and heedleffnefs; and then hufbandry paffed almoft entirely into the hands of farmers.

The famous work attributed to Hartlib, and called the Legacy, was only drawn up at Hartlib's requeft; and, after paffing through his correction and revifal, was publifhed by him. The real author of this treatife was R. Child. It confifts of one general anfwer to the following queftion, namely, "What are the actual defects and omiffions, as alfo the poffible improvements in Englifh hufbandry?"

Several other pieces on hufbandry followed the publication of the Legacy, and greatly improved that neceffary and ufeful art.

The firft writer that infpired his countrymen with a defire of reviving the ftudy of agriculture after the reftoration was Evelyn; who, being followed by the famous Tull, opened a new fphere for the minds of mankind to range in; and fince this period feveral valuable improvements have been made in the Englifh hufbandry, by a great variety of authors.

Ireland, about the middle of the laft century, began to make no inconfiderable figure in the art of hufbandry. It muft, indeed, be confeffed that Ireland had very ftrong prejudices in behalf of a very wretched method of agriculture, till about the middle of the laft century, when Blythe opened the eyes of that people by his incomparable writings. Since which a certain fpirit of improvement has, more or lefs, been promoted and carried on with great zeal and conftancy by the nobility, clergy, and gentry of that kingdom. In proof of which it will be fufficient to obferve, that the tranfactions of the Dublin fociety for encouraging hufbandry, are now cited by all foreigners in their memoirs relating to that fubject.

After the peace of Aix-la-Chapelle, almoft all the nations of Europe, by a fort of tacit confent, applied themfelves to the ftudy of agriculture; and continued to do fo, more or lefs, amidft the univerfal confufion that foon fucceeded. The French found by repeated experience, that they could never maintain a long war, or procure a tolerable peace, without they raifed corn enough to fupport themfelves in fuch a manner as they fhould not be obliged to fubmit to harfh terms on the one hand, or perifh by famine on the other. Their king therefore thought proper to give public encouragement to agriculture, and has ever been prefent at the making of feveral experiments. The great and rich of various ranks and ftations followed this example, and the very ladies put in for their fhare of fame in this commendable undertaking. Even during the hurry and diftreffes of the laft war, fome attention was paid to agriculture. Prize queftions were then propofed annually in rural academies; particularly at the two academies of Lyons and Bourdeaux. And many alterations were made by the fociety for improving agriculture in Britany.

Since the conclufion of the peace matters have been carried on with great vigour. The univerfity of Amiens has made various propofals to the public for the advancement of hufbandry; while the marquis de Tourbilly, a writer who proceeds chiefly on experience, has the principal direction of a georgical fociety lately eftablifhed at Tours.

The fociety of Rouen alfo deferves our notice: nor have the king and his minifters thought it unworthy their notice. The archbifhop of the diocefe is one of the members.

We fhall only add on this fubject, that there are at prefent thirteen focieties exifting in France, eftablifhed by royal approbation, for the promoting of agriculture; and thefe thirteen focieties have nineteen co-operating focieties belonging to them, whenever it happened that a diftrict was too large to be effectually taken care of by one fociety.

The art of agriculture is, at prefent, publickly taught both in the Swedifh, Danifh, and German univerfities, where the profeffors may render effectual fervice to their refpective countries, if they underftand the practical as well as the fpeculative parts, and can converfe to as much advantage with the farmer and peafant, as with Virgil and Columella.

Nor has Italy been inactive. The Neapolitans of the prefent age have condefcended to return back to the firft rudiments of revived hufbandry, and begun to ftudy afrefh the agriculture of Crefcenzio, firft publifhed in the year 1478. The people of Bergamo have purfued the fame track, and given the world a new edition of the *Ricordo d'Agricultura di Tarello*, which was originally publifhed at Mantua in 1577.

The duchy of Tufcany has embibed the fame fpirit. A private gentlemen has lately left his whole fortune to endow an academy of agriculture. The firft ecclefiaftic in that duchy is prefident of the fociety, and many of the chief noblity are members. Even Ferrara, a fmall territory in the papal dominions, has contributed its juft contingent, and made fome laudable attempts in hufbandry.

Animated with a defire that the people under his government fhould excel in hufbandry, his Sardinian majefty has fent fubjects to learn the practice of foreign countries, and made feveral attempts to eftablifh a better method of agriculture among his fubjects.

In Poland, where a natural fertility of foil feems to difpenfe with the neceffity of calling in improvements, Mr de Bieleufki, grand-marfhal of the crown, has made abundance of fuccefsful attempts to introduce the new hufbandry among his countrymen, and procured the beft inftruments for that purpofe from France and other parts of Europe.

The Hollanders give little attention to agriculture, if we except one fingle collateral inftance, namely, the draining of fens and moraffes; and even that has proceeded more from the motive of felf-prefervation, than any particular turn towards hufbandry.

In the year 1759, a fociety eftablifhed itfelf at Berne in Switzerland, for the advancement of agriculture, and rural œconomics. That fociety confifts of many ingenious private perfons, and alfo of fome of great weight and influence in the republic; moft of them men of a true caft for the improvement of hufbandry, being enabled to join the practice with the theory. They have already publifhed feveral ufeful pieces, which we fhall be careful to infert under their proper heads.

We muft not omit to mention here, that Linnæus and his difciples have performed great things in the north of Europe, particularly in difcovering new, profitable, and well tafted food for cattle. At the fame time Sweden has augmented a commerce that had been long cramped within narrow bounds, and beftowed fuccefsful labours on a foil, which was before looked upon as cold, barren, and incapable of melioration; of this the late memoirs publifhed at Stockholm will be a lafting monument.

Denmark, as well as many courts in Germany, follow the like example. His Danifh majefty encourages, in particular, the woollen manufacture; and the late king fent three perfons into Arabia Felix, to make remarks, and bring over fuch plants and trees as may be ufeful in hufbandry, building, &c.

At the fame time the duchy of Wirtemberg, a country no ways unfavourable to corn and pafturage, has not failed to contribute its affiftances towards the improvement of agriculture, having fome time ago communicated to the public its œconomical relations from the prefs at Stutgard.

Nor have the learned of Leipfic and Hanover been inattentive to this great art of fupporting human kind, and that amidft all the rage and devaftations of war; witnefs the *Journal d'Agriculture*, printed at Leipfic, and the *Recueils d'Hanovre*, printed at that city.

Even Spain, naturally inactive on thefe occafions, in fpite of all the prejudices of a bigotted religion, has invited Linnæus, with the offers of a large penfion, to fuperintend a college founded for the fake of making new inquiries into the hiftory of nature, and the art of agriculture.

But England alone exceeds all modern nations in hufbandry; and there is reafon to hope, from the fpirit that now animates a great number of the nobility and gentry, that this ufeful art will, in a few years, be carried to a much greater degree of perfection than it ever yet reached in any age or country. The refpectable patriots that form the fociety eftablifhed at London, for the encouragement of arts, feem determined to contribute all that lies in their power towards the advancement of agriculture. They have already done much, and there is reafon to hope they will do more. A vaft variety of different machines for facilitating the practice of agriculture have been fent them in confequence of their large premiums and bounties. Such munificence and attention to public profperity may be truly called royal, as it would caft a luftre on the greateft monarch that ever fwayed a fceptre. We fhall conclude this hiftory, with obferving, that the reader will find under the proper articles a more minute account of the various improvements that have been lately made in the different parts of Europe.

AGRIMONY, a troublefome pyrennial plant in pafture grounds. It has generally a fingle, round, rough ftalk, with leaves placed alternately upon it, which are winged with fmaller leaves placed between the larger pairs. The yellow flowers grow alternately along the ftalk, in a long row, after the manner of a fpike, and are fucceeded by rough feeds.

AIR, that thin dilatable, and compreffible body in which we breathe, and which furrounds the earth to a great height.

The air, befides its various other ufes, is a principal caufe of the vegetation of plants, an inftance of which we have from Mr. Ray, in the Philofophical Tranfactions, of lettuce-feed, that was fown in the glafs receiver of the air-pump, which was exhaufted and cleared from all air, which grew not at all in eight days time; whereas fome of the fame feed that was fown at the fame time in the open air, was rifen to the height of an inch and an half in that time; but the air being let into the exhaufted receiver, the feed grew up to the height of two or three inches in the fpace of one week.

Another inftance of the ufefulnefs of the air in vegetation, is the fedum, which will pufh out roots without earth and water, and live for feveral months: and fome forts of aloes, if hung up in a room entirely fecured from frofts, will remain frefh for fome years, though they will fenfibly lofe in their weight. Air is capable of penetrating the porous and fpongy parts of plants, and being there contracted, of dilating itfelf again.

The air operates alfo within the bowels of the earth, and, by its fubtilty perfpiring through the pores, affifts in the rarefaction of the crudities of the earth, and in the difpelling all fuperfluous moifture, entering into the very pores and veins of the trees, plants, herbs, &c. carrying along with it thofe falts contained either in itfelf, or lodged in the earth: which falts or juices are altered according to the feveral figures or dimenfions of the different ftrainers or veffels of thofe feveral plants which grow upon the fame fpot of earth, which is fo impregnated with thefe falts: and thence thofe varieties in in taste and smell proceed, notwithstanding they all receive their nourishment from the same stock that is lodged in the earth.

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

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

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

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

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

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

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

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

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

This put the curious Dr. Hales upon further researches to find out what proportion of air he could obtain out of the vegetables in which it was lodged and incorporated; and, from a vast variety of curious and accurate experiments, concludes, that air abounds in vegetable substances, and bears a considerable part in them: and, that if all parts of matter were only endowed with a strongly attracting power, all nature would then become one unactive cohering lump.

Wherefore it was absolutely necessary, in order to the actuating this vast mass of attracting matter, that there should be every where mixed with it a due proportion of strongly repelling elastic particles, which might enliven the whole mass, by the incessant action between them and the attracting particles.

And since these elastic particles are continually in great abundance reduced by the power of the strong attracters, from an elastic to a fixed state, it was therefore necessary, that these particles should be endued with a property of resuming their elastic state, whenever they were disengaged from that mass in which they were fixed, that thereby this beautiful frame of things might be maintained in a continual round of the production and dissolution of vegetable, as well as animal bodies.

The air is very instrumental in the production and growth of vegetables, both by invigorating their several juices, while in an elastic active state, and also by greatly contributing, in a fixed state, to the union and firm connection of the several constituent parts of those bodies, viz. their water, fire, salt, and earth.

To conclude, by reason of those properties of the air before-mentioned, it is very serviceable to vegetables, in that it collects up and breaks open the clouds, those treasures of rain, which nourishes the vegetable tribe.

The air also helps to waft or disperse those foggy humid vapours which arise from the soil, and would otherwise stagnate, and poison the whole face of the earth.

The air, by the assistance of the sun, assumes and sublimates those vapours into the upper regions; and these foggy humid vapours are, by this sublimation, and the coercive power of the air and sun, rarefied, and made again useful in vegetation.

On the contrary, the air, which in so many ways is subservient to vegetables, is also, upon some accounts, injurious and pernicious to them; not only to the ligneous, herbaceous, and flowery parts above, but also to the roots and fibres below the earth: for as the air penetrates deep into the soil, it is natural to conclude, that a dry, husky, scorching air, may be very prejudicial to the tender fibres of new planted vegetables.

ALDER-TREE, the name of a tree very common in most parts of England. It hath male and female flowers, which are produced at remote distances on the same plant; the male flowers are digested into a long juli or catkin, which is loose, imbricated, and cylindrical. The female flowers are collected into a conical scaly head, and are succeeded by scaly cones.

These trees delight in a moist soil, where few other trees will thrive, and are a great improvement to such lands; they are propagated either by layers, or planting of truncheons about three feet in length. The best time for this is in February, or the beginning of March; these should be sharpened at one end, and the ground loosened with an instrument before they are thrust into it; lest, by the stiffness of the soil, the bark should be torn off, which may occasion their miscarriage. These truncheons should be thrust into the earth two feet at least, to prevent their being blown out of the ground by strong winds, after they have made stout shoots. The plantations should be cleared from all such weeds as grow tall, otherwise they will overbear the young shoots; but when they have made good heads, they will keep down the weeds, and will require no farther care.

If you raise them by lying down the branches, it must be performed in October; and by the October following, they will have taken root sufficient to be transplanted out; which must be done by digging a hole, and loosening the earth in the place where each plant is to stand, planting the young trees at least a foot and a half deep, cutting off the top to about nine inches above the surface, which will occasion them to shoot out many branches.

The

The diſtance theſe trees ſhould be placed, if deſigned for a coppice, is ſix feet ſquare; and if the ſmall lateral ſhoots are taken off in the ſpring, it will very much ſtrengthen your upright poles, provided you leave a few ſmall ſhoots at diſtances upon the body thereof, to detain the top for the increaſe of its bulk.

Theſe trees may be alſo planted by the ſide of brooks, as is uſual for willows, where they will thrive exceedingly, and may be cut for poles every fifth or ſixth year. This wood is in great requeſt with the turners, and will endure a long time under ground, or to be laid in water. *Miller's Gard. Dict.*

Alder makes an extraordinary fence againſt rivers and ſtreams, and preſerves the banks from being undermined by the water; becauſe it is always ſending ſuckers from the loweſt roots, which makes it very uſeful, where ſtreams wear away the banks, and are widening of their courſe. *Mortimer's Huſbandry.*

Alder has one peculiar and beneficial property, namely, that no beaſt will crop it, be it young or old, which ſaves the great charge of fencing it after planting. *Ellis's Timber Tree improved.*

ALE, a fermented liquor obtained from the infuſion of malt, and differing only from beer in having a leſs proportion of malt and hops. *See the articles* BEER *and* BREWING.

GILL-ALE, is ale in which the dried leaves of gill, or ground-ivy, have been infuſed. It is eſteemed good in diſorders of the breaſt, and obſtructions of the viſceræ.

ALLEY, in the new huſbandry, implies the vacant ſpace between the outermoſt row of corn on one bed, and the neareſt row to it on the next parallel bed. *See* BED.

The practice of the new huſbandry has already ſufficiently ſhewn, that too narrow alleys would hardly anſwer any of the ends for which they are intended; and, on the other hand, the making them too wide is a loſs of ground. About four feet, excluſive of the ſpaces or partitions between the rows of corn in the beds, is a good middling breadth.

It is not indeed neceſſary to make the alleys quite ſo wide in good ſoils; an intelligent huſbandman will eaſily judge what breadth is moſt proper. But what greatly merits the attention of every one, and ought never to be loſt ſight of, is, that wide alleys are more eaſily and much better ſtirred than thoſe which are narrower: for when an alley is wide, the large furrow in the middle of it may be cut deep, there being then ſufficient room to turn the earth over towards the rows; while, on the other hand, the earth, in too narrow alleys, cannot be ſtirred deep enough, nor can room be found for what is turned over out of the furrows, without danger of burying great part of the rows.

We will, therefore, ſuppoſe the general breadth of the alleys to be about four feet; but the whole of that breadth is not to be ploughed or ſtirred, either with the plough or cultivator, as ſoon as the field is ſown. Neither of theſe inſtruments ought to go too near the rows of corn, for fear of rooting up the plants; but a ſlip of earth, about ſix inches wide, ſhould be left untouched on the outſide of each bed; by which means the part of the alley that is to be ſtirred, will be reduced to the breadth of three feet; and even that is leſſened in the firſt ploughing before winter by a deep furrow, which is then cut cloſe to, and all along thoſe ſix inch ſlips, and the earth taken out of each furrow, is thrown into the great furrow in the middle of the alley, which it ſerves to fill and arch up. Theſe two ſide furrows make together a breadth of about eighteen inches, and, conſequently leave, in the middle of the alley, a breadth of about eighteen inches more, on which is heaped up the earth thrown out of the two furrows: and thus the alremain all the winter.

The firſt hoeing in the ſpring ſhould turn the earth, heaped up in the middle of the alleys, back towards the rows of corn. The two furrows that were opened before winter are then filled up, and a new one is cut in the middle of the alley.

To perform the firſt hoeing with the common plough, which may be very eaſily done, two turns of that inſtrument will be requiſite, namely, one on each ſide of the alley, as near as poſſible to the beds. But as theſe two turns will not be always ſufficient to form the furrow perfectly, a great deal of earth frequently remaining between it and the bed, a third turn of the plough becomes often neceſſary; and ſometimes a fourth, to hollow the middle furrow as it ought to be.

If this work be performed with the cultivator with two mould-boards, the inſtrument muſt be placed in the middle of the alley, and the horſes in one of the two furrows. The ſhare will eaſily enter a great depth into the earth, which was laid there by the laſt hoeing before winter: and as the horſes advance, that great ridge of earth will be divided into two parts, which will be turned over into, and fill up the furrows that were made before winter, on each ſide of the alley, cloſe to the beds. *See the article* CULTIVATOR.

Thus the great furrow in the middle of the alley will be opened, and the whole operation performed by one turn of the cultivator. The earth thus turned over will be thoroughly ſtirred, and ſo much time and labour will be ſaved by this method, thar the farmer may eaſily afford one or two ſtirrings more in the ſummer, which will always be of great ſervice. *M. de Chateauvieux.*

ALLEY, in gardening, implies a ſtrait walk, bounded on both ſides with trees or ſhrubs, and commonly covered with gravel or graſs.

An alley is diſtinguiſhed from a path, by being broad enough for two perſons to walk a-breaſt, whereas a path is ſuppoſed to admit of only one at a time; but if an alley be wider than ten or twelve feet, it may, with more propriety, be called a walk.

Covered ALLEY, is that where the trees on each ſide meet at the top, ſo as to form a ſhade.

ALMOND-TREE, is generally cultivated in gardens for the beauty of its flowers. Theſe often appear in February, when the ſpring is forward; but if froſt comes on after the flowers appear, their beauty will be of ſhort duration, and in thoſe ſeaſons few almonds are produced; whereas when the trees do not flower till late in March, they ſeldom fail to bear plenty of fruit; many of which will be very ſweet, and fit for the table when green, but they will not keep long.

Almond-trees are propagated by inoculating a bud of theſe trees into a plum, almond, or peach-ſtock, in the month of July. The next ſpring, when the buds ſhoot, you may train them up, either for ſtandards, or ſuffer them to grow for half ſtandards, according to your own fancy.

The beſt ſeaſon for tranſplanting theſe trees, if for dry ground, is in October, as ſoon as the leaves begin to decay; but for a wet ſoil, February is much preferable: obſerve always to bud upon plum-ſtocks for wet grounds, and on almond or peach-ſtocks for dry. *Miller's Gard. Dict.*

ALP, a name in many counties of England for the bulfinch.

AMEL-CORN, the ſame with Spelt. *See* SPELT.

AMERANTHUS, amaranth, or flower-gentle, a genus of very beautiful plants, cultivated in gardens.

There are many ſpecies of this plant, but the three following are the principal generally cultivated, 1. Amaranthus tricolor, 2. Amaranthus bicolor, 3. Flower-gentle, with five ſtamina, and very long cylindrical ſpikes, commonly called princes feathers.

The firſt ſort has been long cultivated in gardens for the beauty of its variegated leaves, which are of three colours, viz. green, yellow, and red; theſe are very elegantly mixed, and when the plants are in full vigour, the leaves are large, and cloſely ſet from the bottom to the top of the ſtalks, and the branches form a ſort of pyramid; ſo that there is not a more beautiful plant than this, when it is in its full luſtre.

The ſecond ſort has been introduced into the Engliſh gardens much later than the firſt ſpecies. It grows to the ſame height with the former, and greatly reſembles it in the manner of its growth; but the leaves have only two colours, which are obſcure purple, and a bright crimſon; theſe are ſo blended as to ſet off each other, and, when the plants are vigorous, they make a fine appearance.

The third ſort, which is a native of America, grows with an upright ſtem above three feet high; the leaves and ftalk are of pale green colour; the fpikes of the flowers are produced from the wings of the ftalks, and alfo in clufters at the extremity of the branches: they are of a bright colour, hang downwards, and fome of them two feet and a half long.

Thefe plants muft be fown on a hot bed in February, or the beginning of March at fartheft; and in about a fortnight's time, if the beds be in good temper, the plants will rife; when you muft prepare another bed covered with good, rich, light earth, about four fingers thick. As foon as this bed is in proper temper to receive the young plants, you fhould raife them up with your finger, fo as not to break off the tender roots, and prick them into your new hot-bed, about four inches diftant every way, giving them a gentle watering to fettle the earth to their roots; but in doing this be very cautious not to bear your young plants down to the ground by hafty watering, for they rarely rife again, at leaft fo as to recover their former ftrength. When your plants are firmly rooted, and begin to grow, you muft obferve to give them air every day, more or lefs, to prevent their drawing up too faft, which weakens their ftems.

In about three weeks or a month's time thefe plants will have grown fo as to ftand in need of another hot-bed, which fhould be of a moderate temper, and covered with the fame rich earth about fix inches thick, into which they fhould be removed; obferving to take them up with as much earth about their roots as poffible, and plant them feven or eight inches diftant every way, giving them fome water to fettle the earth about their roots: and keep them fhaded in the heat of the day, until they have taken frefh root, and be fure to refrefh them often gently with water, and give them air in proportion to the heat of the weather, covering the glaffes every night with mats, left the cold chill your bed, and ftop the growth of the plants.

In the beginning of May you muft provide another hot-bed, which fhould be covered with a deep frame, that your plants may have room to grow. Upon this hot-bed you muft fet as many three-penny pots, as can ftand within the compafs of the frame; thefe pots muft be filled with good rich earth, and the cavities between each pot filled up with any common earth, to prevent the heat of the bed from evaporating, and filling the bed with noxious fteams; then take up your plants from the former hot-bed, with as much earth as poffible about their roots, and place each fingle plant in the middle of one of the pots, filling the pot up with the rich earth, and fettle it clofe to the roots of the plant with your hands; water them gently as before, and fhade them in the heat of the day from the violence of the fun, by covering the glaffes with mats: refrefh them often with water, and give them plenty of air in the day time.

In about three weeks more thefe plants will have attained a confiderable fize and ftrength, fo that you muft now raife the glaffes very much in the day time; and when the air is foft, and the fun is clouded, draw off the glaffes, and expofe them to the open air, repeating it as often as the weather will permit; which will harden them by degrees to be removed abroad into the places where they are to remain the whole feafon, which fhould not be done till the firft week in July, when the air is foft, and in a gentle fhower of rain.

Let them be fet firft near the fhelter of a hedge for two or three days, where they may be fcreened from the violence of the fun, and ftrong winds, to which they muft be enured by degrees. Thefe plants, when grown to a good ftature, perfpire very freely, and muft be every day refrefhed with water, if the weather proves hot and dry; otherwife they will ftint, and never produce fo large leaves, as thofe which are fkilfully treated. *Miller's Gard. Dict.*

AMBERVALIA, a ceremony practifed by the ancient Romans, in order to procure from the gods a happy harveft.

This ceremony confifted of a proceffion in which the victims were conducted thrice round the corn fields before they were facrificed. Twelve priefts walked at the head of the proceffion, which confifted of all the neighbouring inhabitants, every one being crowned with leaves of oak, and finging hymns in honour of Ceres, the goddefs of corn.

AMBLE, a peculiar kind of pace, wherein a horfe's two legs of the fame fide move at the fame time.

In this pace the horfe's legs move nearer the ground than in the walk, and, at the fame time, are more extended: but what is moft fingular in it is, that the two legs of the fame fide, for inftance, the off hind and fore-leg, move at the fame time; and then the two near legs, in making another ftep, move at once; the motion being performed in this alternate manner. So that the two fides are alternately without fupport, or any equilibrium between the one and the other, which muft neceffarily prove very fatiguing to the horfe, being obliged to fupport himfelf in a forced ofcillation, by the rapidity of a motion, in which his feet are fcarcely off the ground. For if in the amble he lifted his feet as in the trot, or even in a walk, the ofcillation would be fuch, that he could not avoid falling on his fide, and it is only by keeping his feet very near the ground, and by the quick alternate motion that he fupports himfelf in this pace, in which the hind leg is not only to move at the fame time with the fore-leg of the fame fide, but alfo to gain on it, or touch the ground a foot, or a foot and a half, beyond the fpot where the latter grounded. The further the hind-leg extends beyond the place where the fore-leg grounded, the better the horfe ambles, and the whole motion is proportionally fafter. Thus the whole difference between the amble and the trot confifts in this, that the two legs moving together in the latter are in a diagonal pofition, whereas, in the former, the two legs of the fame fide move together.

This pace, which is very fatiguing to the horfe, is very eafy to the rider. It has not the roughnefs of the trot, which is caufed by the refiftance of the fore-leg, at the lifting up of the hind; becaufe, in the amble, this fore-leg is lifted up at the fame time with the hind-leg of the fame fide; whereas in the trot the fore-leg of the fame fide is at reft, and refifts the impulfe during the whole time that the hind-leg is in motion.

They who are fkilled in horfemanfhip tell us, that horfes which naturally amble, never trot, and that they are a great deal weaker than others. Colts, indeed, very often move in this manner, efpecially when they exert themfelves, and are not ftrong enough to trot or gallop. Moft good horfes, which have been overworked, and on the decline, are alfo obferved voluntarily to amble, when forced to a motion fwifter than a walk.

The amble may, therefore, be confidered as a defective pace, not being common, and natural only to a very few horfes, which, in general, are weaker than others. Add to this, that fuch amblers as feem the ftrongeft, are fpoiled fooner than thofe which trot or gallop. *Buffon's Hiftoire Naturel, tom.* IV.

There are various methods of difcipline for bringing a young horfe to amble: fome chufe to toil him in his foot pace through new ploughed fields, which naturally inures him to the ftroke required in the amble; but this diforderly toil is very apt to weaken, and fometimes to lame a young horfe. Others attempt it by ftopping him in a gallop, or trot; fo that by lofing both, he neceffarily ftumbles on an amble; but this is apt to fpoil a good mouth and rein, and expofes the horfe to the danger of an hoof-reach, or finew-ftrain, by over-reaching, &c. Some prefer ambling by weights as the beft way; and in order to this, either overload the horfe with exceffive heavy fhoes, or fold thick pieces of lead about the fetlock pafterns, without confidering that the former are apt to make him interfere, or ftrike fhort with his hind-feet; and that the latter, befides that mifchief, expofe the horfe to incurable ftrains, crufhing of the coronet, breeding of ring-bones, &c. Others load the horfe with earth, lead, &c. which often occafion a fwaying of the back, over-ftraining of the fillets, &c. Some endeavour to make him amble in hand, before they mount his back, by means of fome wall, fmooth pale, or rail, and by checking him in the mouth with the bridle-hand, and correcting him with a rod on the hinder hoofs, and under the belly, when he treads falfe; but this is very apt to fpoil a fpirited horfe, even before he can underftand what you would have him do.

The beſt method ſeems to conſiſt in trying with your hands, by a gentle and deliberate racking and thruſting of the horſe forwards, by helping him in the weak part of his mouth with your ſnaffle, which muſt be ſmooth, big, and full; and correcting him firſt on one ſide, then on the other, with the calves of your legs, and ſometimes with a ſpur. If you can by this means make him fall readily into an amble, though in a ſhuffling and diſorderly manner, much labour will be ſaved; for that aptneſs to amble will render the tramel more eaſy to him, and he will find the motion without ſtumbling, or being frighted. *See the article* TRAMEL. *Bradley's Dict. Ruſt.*

AMPHITHEATRE, in gardening, implies a temple of view, erected on a riſing ground, of a ſemicircular figure.

Theſe amphitheatres are formed of ſeveral ſorts of ever-greens, obſerving to plant thoſe of the ſhorteſt growth in front, and the talleſt trees, ſuch as pines, firs, cedars, &c. behind. But as the modern taſte in gardening excludes regularity and ſtiffneſs, amphitheatres are at preſent but little eſteemed.

AMBRY, ACEMBRY, or AUMERY, a pantry, or cupboard to ſet victuals in.

ANBURY, a kind of wen, or ſpongy wart growing on any part of a horſe's body. *See the article* WEN.

ANANAS, the pine-apple. *See* PINE-APPLE.

ANEMONE, or the wind-flower, a genus of fine flowers very common in the Engliſh gardens.

There are various ſpecies of the anemone, but the beſt ſorts are natives of the eaſt, from whence the roots were brought originally; but have been ſo greatly improved by culture, as to render them ſome of the chief ornaments of our gardens in the ſpring. The principal colours of theſe flowers are red, white, purple, and blue, and ſome are finely variegated with red, white, and purple. There are many intermediate ſhades of theſe colours; the flowers are large, and very double, and, when properly managed, are extremely beautiful.

The ſoil in which theſe flowers will thrive extremely, may be compoſed in the following manner. Take from a common or paſture land a quantity of untried or virgin earths of a light ſandy loom, or hazel mould, obſerving not to take it above ten inches deep below the ſurface; and if the turf be taken with it the better, provided it have time to rot thoroughly before it is uſed: mix this with a third part of rotten cow-dung, and lay it in a heap, keeping it turned over at leaſt one a month for eight or ten months, the better to mix it, and rot the dung and turf, and let it have the advantage of the free air.

This earth ſhould be mixed twelve months before it is uſed, if poſſible; but if you are conſtrained to uſe it ſooner, you muſt turn it over the oftener, to mellow and break the clods; and obſerve to rake out all the parts of the green ſward that are not quite rotten before you uſe it; for, if ſuffered to remain, would prove prejudicial to the roots.

The beginning of September is a proper time to prepare the beds for planting, when this compoſt ſhould be laid, at leaſt, two feet and a half thick; and in the bottom there ſhould be about four or five inches of rotten cow-dung, or the rotten dung of an old melon or cucumber-bed, ſo that you muſt take out the former ſoil of the beds to make room for it. Your earth ſhould be laid in the beds at leaſt a fortnight or three weeks before you plant the roots, that it may ſettle properly.

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

Towards the latter end of June the leaves of your firſt blown roots will begin to decay; ſoon after which you muſt take them out of the ground, clearing them from decayed ſtalks, and waſhing them to clean the earth from the roots; then ſpread them upon a mat, in a dry ſhady place, till they are perfectly dried, when you may put them up in bags, and hang them out of the reach of mice, or other vermin, which will deſtroy many of the roots if they come at them. *Miller's Gard. Dict.*

ANGORA *goat.* *See the article* GOAT.

ANJOU *cabbage-ſhrub*, an excellent vegetable both for the kitchen, and the food of cattle, cultivated with great ſucceſs in ſeveral provinces of France; and that ingenious huſbandman, the marquis of Turbilly, lately ſent a parcel of the ſeeds to our ſociety for the encouragement of arts, who very readily diſtributed them to ſuch gentlemen as applied to them for that purpoſe, in order to their being cultivated here; ſo that there is reaſon to hope, that this uſeful plant will ſoon become common in England. The following inſtructions are given by the marquis de Turbilly, for cultivating the Anjou cabbage.

" The great Anjou cabbage is one of the moſt uſeful leguminous plants for country people. It will grow in almoſt any ſoil, not excepting even the moſt indifferent, provided it be ſufficiently dunged. It is but little known about Paris, and in many other places, where it might be cultivated to great advantage.

" The ſeeds of this cabbage are commonly ſown in June, in a quarter of good mould, in the kitchen garden, and watered from time to time in caſe of drought. The plants will riſe pretty ſpeedily, and ſhould be thinned ſoon after, wherever they ſtand too thick. The next care is to keep them free from weeds whilſt they continue, by hoeing the ground between them. About the firſt of November, they ſhould be tranſplanted into the field where they are to remain. They ſhould be planted there in trenches dug with a ſpade, pretty deep, that is, they ſhould be buried almoſt up to the leaves. The diſtance between them ſhould be two feet, or two feet and a half every way, according to the goodneſs of the ſoil. Particular care ſhould be taken never to plant them with a dibble, as gardeners plant other ſorts of cabbages. A layer of dung ſhould be ſpread along the bottom of the trench, and the roots of the tranſplanted cabbages covered therewith. The mould taken out ſhould then be returned back upon the dung; and as the trench will then no longer hold it all, there will remain a ridge between each row of cabbages.

" Towards the middle of May enſuing, the ground ſhould be well ſtirred between the plants, with a ſpade, or ſome other proper inſtrument, and its whole ſurface laid quite level. After this nothing more remains to be done, except pulling up the weeds, from time to time, as they appear.

" Many huſbandmen ſow the ſeeds of theſe cabbages with thoſe of hemp; and though this may not be ſo ſure as the former, it often ſucceeds very well, eſpecially in wet years. When the hemp is pulled up, a multitude of little cabbages are ſeen, and which having then a free air, grow apace. They are tranſplanted about the firſt of November in the manner before directed, and are preferred to thoſe of the kitchen garden, becauſe they are not ſo apt to run up to ſeed the next ſpring; an accident which ſometimes happens to a few of theſe cabbages, in certain years; and it then becomes neceſſary to replace them by others which have not run up, and which are reſerved for this purpoſe in a ſeparate ſpot of ground.

" Several farmers uſe a plough to cut the trench for tranſplanting theſe cabbages: but then they do not remove them till the ſpring, leaving them, in the mean time, in the place where they were ſown. They afterwards give the earth a ſtirring with a ſpade, and lay it ſmooth towards the end of May, in the manner before directed. Whole fields of theſe cabbages may be ſeen on many farms in Anjou and Poitou, and which prove a very uſeful reſource.

" In the month of June, ſuch of theſe cabbages as are already large, and do not turn in their leaves for cabbaging, but ſtill continue green, begin to be fit for uſe, and ſoon ariſe at their full perfection, which they retain till the next ſpring, when they begin to run up, and afterwards bloſſom. Their ſeeds ripen towards the end of July, and what is intended for ſowing ſhould then be gathered.

" In

"In Anjou, when these cabbages are entirely run up, they generally grow to the height of seven or eight feet: sometimes they reach to eight feet and a half, or nine feet; nay, some have even been seen of a greater height.

"From the month of June, when these cabbages begin to be fit for use, their leaves are gathered from time to time, and they shoot out again. They are large, excellent food, and so tender that they are dressed with a moment's boiling. They never occasion any flatulencies or uneasiness in the stomach; and are also very good food for cattle, which eat them greedily. They likewise greatly increase the milk of cows.

"Such are the properties of this kind of cabbage, greatly esteemed in Anjou, Poitou, Britany, Le Maine, and some other neighbouring provinces. In Anjou farmers are bound by their leases to plant yearly a certain number of these cabbages, and to leave a certain number of them standing when they quit their farms.

"This cabbage forms a kind of shrub, the great utility of which may be gathered from this, that its leaves afford nourishment to men and cattle; and its stalk, which is about the thickness of one's wrist, is used, when dry, for fuel.

"It sometimes happens in extremely severe winters, that some of these cabbages are frozen; and this, in the above provinces, is considered as a very great loss; but that accident is rare, because this kind of cabbage resists frosts better than most others.

"The ground where these cabbages are planted should be fenced in very carefully by hedges or ditches, to preserve it from the depredations of cattle, which are extremely fond of them. With this precaution I have made several plantations of them, near the houses erected in the midst of the heaths and commons I have broken up and improved; and they have succeeded very well, though the soil is but indifferent in many places.

"I have, near my house in Anjou, two well inclosed fields, destined for this sort of plantation. They are planted alternately every year with young cabbages. When these are pulled up, after they have seeded in the second year, at the time already mentioned, the ground where they stood is dug up, and sowed with pease or beans, the crop of which being taken off before the first of November, makes room for planting new cabbages at the proper season. The soil is loosened and enriched by the pease and beans, and by this means the land is never rested; nor is it ever exhausted, because it is dunged whenever the cabbages are planted.

"These cabbages are of such excellent service to me, that I have often wondered at their not being cultivated in all the different countries of Europe. I believe they would succeed every where, and I advise all husbandmen to make plantations of them.

"I wish that this short memoir, founded on my own experience, may contribute to extend the culture of this useful plant."

ANNUAL *plants*, such as continue one year only; or such as spring up, ripen their seed, and perish in that space of time. Thus wheat, barley, oats, beans, pease, &c. are annual plants.

ANNUAL *meadow-grass*, called in some parts of England, Suffolk-grass, a species of very beautiful grass, making the finest turfs, and seems particularly well adapted to dairy farms. *See* Plate I. Fig. 1. *which represents this grass in its perfection.*

"I have, says Mr. Stillingfleet, seen whole fields of it in High Suffolk, without any mixture of other grasses; and as some of the best salt butter we have in London comes from that country, it is most likely to be the best grass for the dairy." He adds, that he observed, upon Malvern-hill, a walk made there for the convenience of the water drinkers, which was, in many places, covered over with this grass, in less than a year, though he could not find a single plant of it besides in any other part of the hill. This was doubtless owing to the frequent treading, which has the greatest tendency to make this grass flourish; and therefore it is very evident, that rolling must be very serviceable to it. As the flowers and stems of this plant do not grow brown so soon as those of other grasses, nor cover the radical leaves so much, because they are considerably shorter, this affords a more pleasing turf than any other grass." *Stillingfleet's Miscel. Tracts.*

Mr. Ray observes of the common meadow grass, that it is a slender and succulent plant, very agreeable to cattle, and a fattener of them; that it delights in a rich soil; and that it is not injured by being trodden under foot, and therefore is commonly found along the sides of paths and roads. It spindles and ears in the spring, and continues to shoot during the whole summer. *Ray's History of Plants.*

As plenty of the seeds of this grass might be very easily procured from Suffolk, it might be propagated and cultivated in all parts of England, where the soil and situation are adapted to its growth.

It is indeed amazing, that amidst the great variety of grasses which grow naturally in England, that so few farmers have had any thoughts about improving their meadows and pastures; they seem to take every thing upon trust, imagining, perhaps, that the grass they find growing naturally in their grounds, is much better, and more adapted to the nature of the soil, than any other they could sow, or adopt in its stead.

But this is surely a very narrow way of thinking, and, should it be encouraged, would soon put a stop to all improvements in husbandry. We have been too long influenced by custom: it is time for us to shake off our fetters, and rouze ourselves from the deep lethargy which has prevented us from receiving, or at least from removing, the disadvantages of the old husbandry, which, in many respects, is highly disadvantageous both to the farmer and his country.

ANNUAL *poa-grass*. *See* POA.

ANTICOR, a disease among horses, consisting of a malignant swelling in the breast, which extends sometimes to the very sheath under the belly; and is attended with a fever, great depression and weakness, and a total want of appetite.

The cure should be first attempted by large and repeated bleedings, to abate the inflammation; emollient clysters should be injected twice or thrice a day, with an ounce of sal prunella in each. The swelling should be bathed with marshmallow ointment, and an opening poultice, with onions boiled in it, should be daily applied over it. If by this method continued four or five day, the inflammation in the throat and gullet be removed, the attention should more particularly turn to encourage the swelling on the breast, and bring it, if possible, to matter: let the poultice therefore be continued, and give the horse two ounces of Venice treacle, dissolved in a pint of beer, every night. When the swelling is grown soft, it must be opened with a knife, and dressed with turpentine digestive, the danger being then over.

But should it be found impracticable to bring the swelling to matter, and the swelling upwards should increase so as to endanger suffocation, authors have advised to pierce the humour with a hot pointed cautery, and dress part with the turpentine digestive, sharpened with a small quantity of Spanish flies and euphorbium in powder, in order to stimulate and promote a greater discharge; at the same time fomenting and bathing the adjacent parts with ointment of marshmallows.

M. Gueriniere, as well as Soleysel, have advised opening the skin, when the tumour cannot be brought to matter, in order to introduce a piece of black hellebore-root steeped in vinegar, and to confine it there for twenty-four hours; this also is intended as a stimulant, and is said to answer the intention, by occasioning sometimes a swelling as big as a man's head. *Bartlet's Farriery.*

ANTS, or *pismires*, are injurious both to pasture lands and gardens; in the former by throwing up hills, and in the latter, by feeding on the fruit, &c.

The method of keeping them from trees is by encompassing the stem with a circle or roll of wool, newly plucked from the sheep's belly, four fingers in breadth, or by laying saw-dust round the tree. The same will be effected when you anoint the tree with tar; but as tar is prejudicial to trees, human ordure will, perhaps, do better; because if any of it be put into their hills, it will kill them. *Mortimer's Husbandry.*

Ant-*hills*, the habitations of the ants, consisting of little eminences, composed of small particles of sand, lightly and artfully laid together.

These hills, or habitations of the ants, though very convenient for themselves and their own societies, are very destructive to the farmer, depriving him of as much land as these hills cover; which may be often computed at a tenth part, or more, of his valuable grass lands. Nay, in some places, where negligence has suffered them to multiply, almost half of it has been rendered useless: the hills standing as thick together as grass-cocks in hay time: and what is most surprizing, this indolence is defended by affirming, that the area or superficies of their land is thereby encreased: whereas it is well known, by the industrious, that very little or no grass ever grows thereon; and, therefore, if the surface be increased, the produce is proportionably decreased. *See the article* Mole-Hill.

It has been a custom in many places at the beginning of winter, and often when the weather was not very cold, to dig up the ant-hills, three or four inches below the surface of the ground; and then to cut them in pieces, and scatter the fragments about: but this only disseminates the insects instead of destroying them; they can hide themselves among the roots of the grass for the present; and then collect themselves together again upon any little eminence, of which there are great numbers ready for their purpose, viz. the circular ridges round the hollows, where the hills stood, as is very soon visible to a curious observer. A much better method seems therefore to be pointed out by a writer in the *Museum Rusticum*, vol. vi. namely, to cut off the hills entire, and even with the surface; and to let them lie whole at a little distance, with their bottom upwards: by this means the ants, which are known to be very tenacious of their nests, will continue in their habitations, while the rains, by running into their holes of communication, assisted afterwards by the frosts, which will now sooner penetrate to their dwellings, will destroy them. Perhaps a little soot sown on the places, and washed in with the rains, would have a better effect. The hills when rendered mellow by the frosts, may be broken and dispersed about the land. This method of cutting the hills even with the surface, has one advantage; it leaves the pasture-land even and fit for mowing; and at the same time the little eminences being taken away, the insects are exposed to the wet, which is disagreeable to them.

In wet weather these insects accumulate cavernous heaps of sandy particles among the grass, called by the labourers sprout-hills; which quickly take off the edge of a scythe. These hills, which are very light and compressible, the above writer assures us from experience, may be readily stamped down, by the feet of the hay-makers, and the insects, together with their eggs and earth, easily pounded to a mortar. This should be repeated a second, and perhaps a third time, after the itinerant foragers have returned from their quest of food, and have begun to raise new structures near the old demolished habitations.

APHERNOUSLI, or *arkenousli*, a species of pine, or pinaster, growing wild on the Alps, where one would think it impossible that any tree could vegetate and prosper; and therefore would probably thrive to great advantage on our bleak, barren, rocky, mountainous tracts of land. See Plate I. Fig. 2.

The timber is large, and has many uses, especially within-doors, or under cover. The branches resemble these of the pitch-trees, commonly called the spruce fir: but the cones are more round in the middle, being of a purplish colour, shaded with black. The bark of the trunk, or bole of the tree, is not reddish like the bark of the pine, but of a whitish cast, like that of the fir. The husk, or sort of shell, which incloses the kernels, is easily cracked, and the kernels are covered with a brown skin, which peels off: they are about as large as a common pea, triangular like buck-wheat, and white and soft as a blanched almond, of an oily agreeable taste, but leaving in the mouth that small degree of asperity, which is peculiar to wild fruits, and is not unpleasing. These kernels make a part sometimes in a Swiss desert; they supply the place of mushroom-buttons in ragouts; and are also recommended in consumptive cases, on account of their balsamic oil.

Wainscoting, flooring, and other joiner's work, made with the planks of aphernousli, are of a finer grain, and more beautifully variegated than deal, and the smell of the wood is more agreeable. From this tree is extracted a white odoriferous resin.

The aphernousli is of a healthy, vigorous nature, and will bear removing when it is young, even in dry warm weather. The wood makes excellent firing in stoves, ovens, and kilns; but is dangerous to be used on the hearth or in grates, being apt to splinter and fly to a considerable distance.

This tree is the *pinus cembra* of Matthioli and Linnæus, the *pinus foliis quinis* in Haller, the *larix semper-virens* in the German Ephemeris, the *libanus carpathius* of some writers, and the *pin a cinque feüeilles*, N° 20. in Du Hamel. It grows in great abundance on the most mountainous and coldest parts of the Briançonnois, where it is called by the natives *alviez*. It bears some resemblance to the white Canada-pine, which is better known in England by the name of Weymouth-pine. *Essays on Husbandry.*

APIARY, a bee-garden, or place where bees are kept. See the article Bees.

APOPLEXY, or, as the farriers generally call it, the *staggers*, a disease to which the horse is subject, and by which the creature drops down suddenly without sense or motion, except a working of his flanks, proceeding from the motion of the heart and lungs, which never ceases while any spark of life remains.

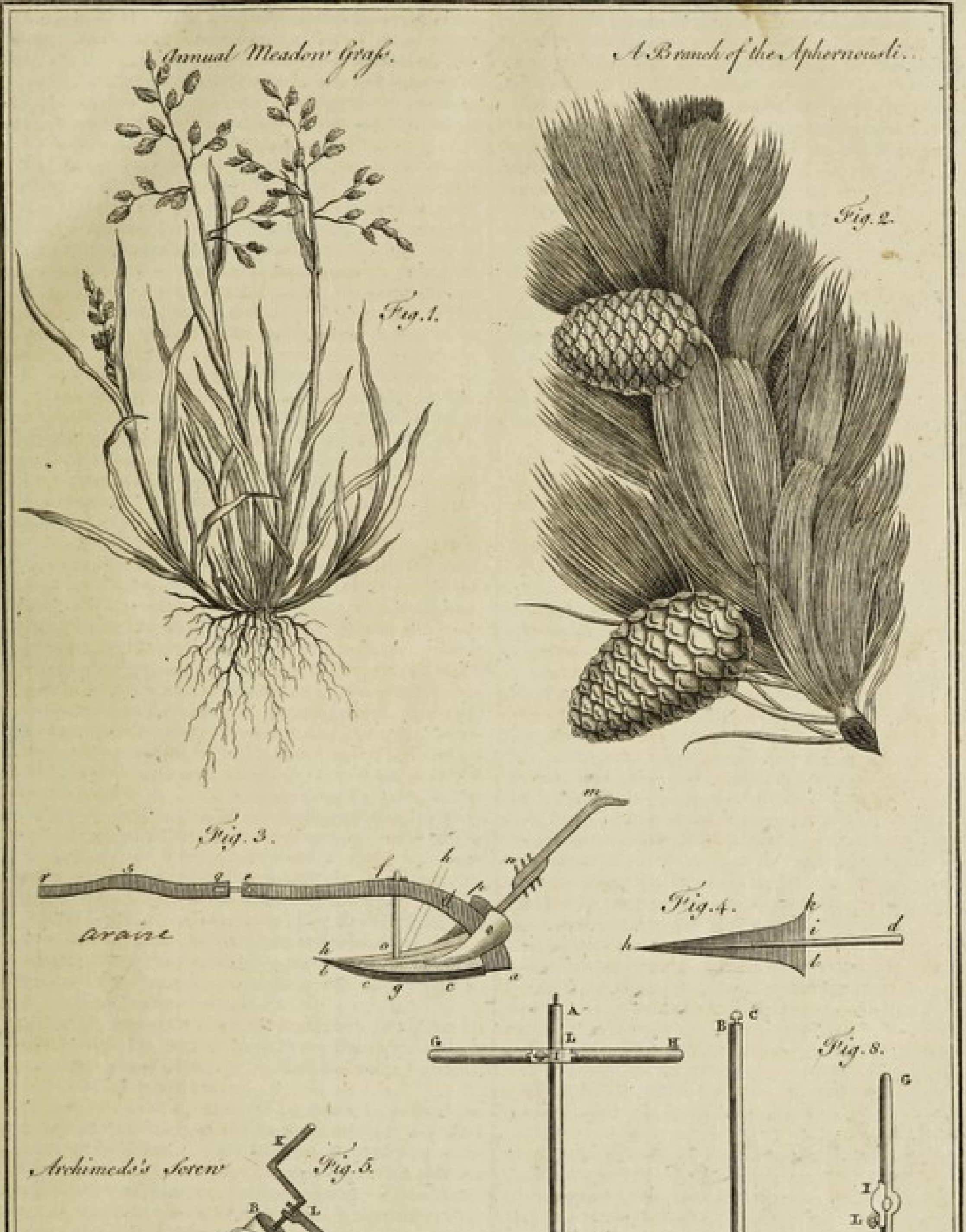
The previous symptoms are drowsiness, watry moist eyes, somewhat full and inflamed, a disposition to reel, feebleness, a bad appetite, and almost continual hanging of the head, or resting it in his manger, sometimes with little or no fever, and scarce any alteration in the dung or urine. When the apoplexy proceeds from water collected in the sinuses and ventricles of the brain, the horse has generally, besides all the foregoing symptoms, a disposition to rear up, and is apt to fall back, when any one goes to handle him about his head. The reason of his falling backwards seems to be obvious, because when the head is raised with his mouth upwards, the water in the ventricles causes a weight upon the cerebellum, or part lying under the brain, and origin of the nerves, so as to deprive the creature of sense and motion at once: this does not, however, prove suddenly mortal. Young horses are most subject to it, and, with proper helps, and good usage, sometimes get over it: but when the apoplexy proceeds from wounds or blows on the head, or from any other cause producing ruptures in the blood-vessels, or from matter collected in the brain, or its membranes; or if any part of the brain or its membranes be indurated, or grown callous, by long continuance, the horse will not only have most of the symptoms already described, but will be frantic by fits, especially after his feeds, so as to start and fly into motion at every thing that comes near him. These cases are extremely dangerous, and seldom admit of a perfect recovery. But when horses fall down suddenly and work violently at their flanks, without any ability to rise, even after plentiful bleeding, such horses seldom recover.

All that can be done in such cases is to strike the veins in several parts at once, to raise up the horse's head and shoulders, propping them with plenty of straw; and if he survive the fit, to cut several rowels; though in case of ruptured vessels, or if any kind of extraneous matter be lodged on the brain, or its membranes, all these helps will be of little service.

But if the apoplectic fit happens to be only the effect of a plethora, or fulness of blood, from high-feeding, and want of sufficient exercise; or if it be the effect of a sizy blood, which is often the case of many young horses, that have been fed for sale, or from catching cold while the blood is in this state, the cure will not be attended with any great difficulty, notwithstanding a horse, in these circumstances, may reel and stagger, and sometimes fall down suddenly.

First of all bleed plentifully, and keep the horse for some time to an opening diet of scalded bran, and sometimes scalded barley, lessening the quantity of his hay. After two days repeat the bleeding, but in a smaller degree. If the horse has a cold, it will be proper to give him pectoral drinks, proper for that disorder. *See* Cold.

But if no symptom of a cold appear it will be necessary, after bleeding and a spare diet, to give him two or three


Annual Meadow Grass.
A Branch of the Aphernousli.
Fig. 1.
Fig. 2.
Fig. 3.
araire
Fig. 4.
Archimeds's Screw
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Borer.
J. Hulett Sculp.

purges, not only to remove the plethora or fulneſs, but to attenuate and thin his blood, for which the following is recommended:

"Take of the fineſt ſuccotrine aloes, an ounce and a quarter; freſh jallap, two drams; ſalt of tartar, three drams; native cinnabar, or the cinnabar of antimony, half an ounce; make it into a ball with a ſufficient quantity of ſyrup of roſes or marſhmallows; adding twenty or thirty drops of chemical oil of anniſeeds, making the whole into a ball, rolling it in liquorice-powder."

The purge may be made ſtronger or weaker by increaſing or diminiſhing the jallap. Let this be repeated two or three times, and the horſe will probably recover, without a relapſe. Powder of antimony, or its preparations, as the liver, the *crocus metallorum*, its cinnabar, or the native cinnabar, mixed with equal parts of gum guiacum, may be alſo given in ounce doſes, for three or four weeks, to mend his blood, and take off its ſizineſs. Nor ſhould exerciſe, as ſoon as the horſe is able to bear it, be omitted.

When a horſe drops down ſuddenly with hard riding, or violent driving, it in many reſpects reſembles an apoplexy, and all the organs of the head are affected as in an apoplexy; but as this proceeds only from the extraordinary rarefaction of the blood, and its rapid motion, whereby the ſmall veſſels of the brain, heart, and lungs, are ſo extremely diſtended as to cauſe an univerſal preſſure on the origin of the nerves; the horſe by this means loſes all ſenſe and motion, and generally falls ſuddenly, eſpecially upon any ſudden ſtop; becauſe when the bodily motion ceaſes, the circulation of the blood in the veins is not accelerated in proportion to its influx from the arteries, which ſoon produces a ſuffocation and a falling down, without ſenſe or motion. Inſtances of this kind are not uncommon, eſpecially in very hot weather, when the external heat adds greatly to the blood's motion and rarefaction. But as we ſuppoſe in this caſe, little or no fault in the blood, except, perhaps, a plethora, or weakneſs of the veſſels, the quickeſt and readieſt remedy is bleeding; and unleſs the horſe dies with the violence of the fall, which ſometimes happens, or by burſting the ſmall veſſels of the brain or lungs, or happens through polipuſes in the heart or principal veins, he will ſoon riſe of himſelf, or without much help, and may be preſerved from ſuch accidents for the future, by better uſage. *Gibſon on the Diſeaſes of Horſes.*

APPETITE, a certain painful or uneaſy ſenſation, always accompanied with a deſire to eat or drink.

Horſes, more than moſt other creatures, are ſubject to diſeaſes of the ſtomach, particularly to a *want of appetite*, and a *vitiated*, or *voracious appetite*.

Want of APPETITE is when a horſe feeds poorly, and is apt to mangle his hay, or leave it in the rack, and the ſame time gathers little fleſh, and his dung habitually ſoft, and of a pale colour.

Theſe are evident ſigns of a relaxed conſtitution, wherein the weakneſs of the ſtomach and guts may have a very great ſhare. This habitual weakneſs may be either natural and hereditary, or may be cauſed by ſome previous ill management; ſuch as too much ſcalded bran, or too much hot meat of any kind, which relaxes the tone of the ſtomach or guts, and in the end produces a weak digeſtion, and conſequently a loſs of appetite.

The beſt method to harden and recover ſuch horſes, is to give them much gentle exerciſe in the open air, eſpecially in dry weather; never to load their ſtomachs with large feeds, and to keep them as much as poſſible to a dry diet, indulging them now and then with a handful of beans among their oats; but in caſe the horſe grows weak, and requires the help of phyſic, a few laxative purges like the following, ſhould be given.

"Take ſuccotrine aloes, ſix drams; rhubarb in fine powder, two drams; ſaffron dried and powdered, one dram: make it into a ſtiff ball, with a ſufficient quantity of ſyrup of roſes, and add two drams of the elixir proprietatis, prepared with oil of ſulphur by the bell."

This purge will work very gently, and bring the horſe to a better appetite, and ſtrengthen his digeſtion. It may be repeated once a week, or once in ten days, and after the operation of each purge,

"Take a large handful of the raſpings or ſhavings of guaiacum, pomegranate bark, and balauſtines bruiſed, of each an ounce; galangals and liquorice root ſliced, of each half an ounce: let theſe be boiled in ſix quarts of ſmith's forge-water, to three pints; and while it is warm, infuſe in the decoction two drams of ſaffron, and half an ounce of diaſcordium."

Let this be divided into two drinks, and give one after the purge has done working, and the other after two day's intermiſſion; in cold weather the drinks ſhould be warmed before they are adminiſtered: the ſame may be complied with after the laſt purge, and repeated as often as may be neceſſary, continuing to give the horſe conſtant exerciſe in the open free air; and this will be the likelieſt method to ſtrengthen ſuch horſes, as are of weak relaxed conſtitutions.

But where ſuch a habit is contracted by too much feeding, eſpecially on hot ſcalded diet, which is often the caſe of young horſes kept up for ſale, the beſt way is to bleed and purge ſuch horſes, and at the ſame time to rowel them in the belly; for this ſort of feeding eaſily occaſions horſes to be lax, that have no natural diſpoſition to it; for when they grow ſuddenly fat by ſuch management, the ſecretions from the guts become greaſy, which always cauſes weakneſs and relaxation in them, and often forms a proper nidus for the breeding of vermin; all which may be eaſily remedied by purging in the firſt place, and afterwards by proper exerciſe, and a clean diet.

As for thoſe horſes that are of a hot fiery diſpoſition, and loſe their appetites by their heat and fretting, it is a caſe that cannot eaſily be remedied, becauſe of the natural inflammatory diſpoſition of their blood; the only method is to keep them to a cool diet while they are young, and, in country places, to let them run abroad, eſpecially where they have ſtables and warm ranges, to keep them from the inclemency of the weather in winter; for theſe ſort of horſes are always tender, being, for the moſt part, extremely thin ſkinned, and their blood of a thin texture, and eaſily put in motion. For the ſame reaſon, the beſt way, in ſummer, is to bring them up in the day time, and only let them run abroad in the night, they being more hunted with the flies than any other, which keeps them continually upon the fret, and hinders them from thriving. When ſuch horſes live till they are full aged, their heat and fierineſs often abates, ſo that they grow more uſeful; but while they are young, they are more ſubject to inward impoſtumations than horſes of a cooler temperament; and theſe often kill them ſuddenly, or bring them into lingering conſumptive maladies, which in ſome meaſure may be prevented by the above method. *Gibſon on the Diſeaſes of Horſes.*

Vitiated, or *Voracious* APPETITE, is that where the animal is always craving for meat. *See* FOUL-FEEDING.

APPLE-TREE, a fruit-tree ſo well known in this country, that any deſcription of it would be ſuperfluous.

There are a great variety of apples, ſome of which have been introduced from France; but three only of thoſe foreign ſorts are much eſteemed in England, viz. the French rennet, the rennet-griſe, and the violet apple; the other being early fruit, which do not keep long. Beſides, their fleſh is generally mealy, ſo that they do not deſerve to be propagated, as we have many better fruits in England.

The firſt apple which is brought to the London markets is the codlin; a fruit too well known to need any deſcription.

The next is the Margaret apple: this fruit is not ſo long as the codlin, and of a middle ſize; the ſide next the ſun changes to a fair red when ripe, the other ſide is of a pale yellow green; the fruit is firm, and of a quick pleaſant taſte, but does not keep long.

The ſummer pearmain is an oblong fruit, ſtriped with red next the ſun; the fleſh is ſoft, and in a ſhort time mealy; ſo that it is not greatly eſteemed.

The Kentiſh fill-baſket is a ſpecies of codling, of a large ſize, and longer ſhaped than the codlin. This ripens a little later in the ſeaſon, and is generally uſed for baking, &c.

The tranſparent apple. This was brought to England about the year 1724, and was eſteemed a curioſity: it came from Peterſburgh, where it is affirmed to be ſo tranſparent, that the kernels may be perfectly ſeen, when the apple is held to the light; but, in this country, it is a mealy inſipid fruit, ſo as not to be worth propagating.

Loan's pearmain, is a beautiful fruit to the ſight, of a middling ſize; the ſide next the ſun is of a beautiful red, and the other ſide ſtriped with the ſame colour; the fleſh is vinous; but as it ſoon grows mealy, it is not greatly eſteemed.

The quince-apple. This is a ſmall fruit, ſeldom larger than the golden-pippin, but longer, and reſembles the quince in ſhape, eſpecially towards the ſtalk; the ſide next the ſun is of a ruſſet colour, on the other ſide inclining to yellow. This is an excellent apple for about three weeks in September, but it will not keep much longer.

The golden-rennet is a fruit ſo well known in England as to need no deſcription. This ripens about Michaelmas, and for about a month is a very good fruit, either for eating raw, or baking.

The aromatic pippin is alſo a very good apple. It is about the ſize of a nonpareil, but a little longer; the ſide next the ſun is of a bright ruſſet colour: the fleſh has an aromatic flavour: it ripens in October.

The Hertfordſhire pearmain, by ſome called the winter pearmain. This is a good ſized fruit, rather long than round, of a fine red next the ſun, and ſtriped with the ſame colour on the other ſide; the fleſh is juicy, and ſtews well, but is not eſteemed for eating by any nice palates. This is fit for uſe in November and December.

The Kentiſh pippin is a large handſome fruit, of an oblong figure; the ſkin is of a pale green colour; the fleſh is full of juice, which is of a quick acid flavour. This is a very good kitchen fruit, and will keep till February.

The Holland pippin is larger than the former; the fruit is ſomewhat longer, the ſkin of a darker green, and the fleſh firm and juicy. This is a very good kitchen fruit, and will keep late in the ſeaſon.

The monſtrous rennet is a very large apple, of an oblong ſhape, turning red towards the ſun, but of a dark green on the other ſide; the fleſh is apt to be mealy, and is therefore not much valued by thoſe that are curious, and only preſerved for the magnitude of the fruit.

The embroidered apple is a pretty large fruit, ſomewhat ſhaped like the pearmain; but the ſtripes of red are very broad, from whence the gardeners have given it this title. It is a middling fruit, and commonly uſed as a kitchen apple, though there are many better.

The royal ruſſet, by ſome called the leather-coat ruſſet, on account of the deep ruſſet colour of the ſkin. This is a large fair fruit, of an oblong figure, broad towards the baſe; the fleſh is inclinable to yellow. This is one of the beſt kitchen apples we have, and the trees are very great bearers; they grow large and handſome, and the fruit is in uſe from October till April; it is alſo a pleaſant fruit to eat.

Wheeler's ruſſet is an apple of a middling ſize, flat and round; the ſtalk is ſlender; the ſide next the ſun of a light ruſſet colour, the other ſide inclining to a pale yellow when ripe; the fleſh is firm, and the juice has a quick acid flavour; but it is an excellent kitchen fruit, and will keep a long time.

Pile's ruſſet is not quite ſo large as the former, but is of an oval figure, of a ruſſet colour towards the ſun, and of a dark green on the other ſide. It is a very firm fruit, of a ſharp acid flavour; but is much eſtemed for baking, and will keep ſound till April or later, if well preſerved.

The nonpareil is a fruit pretty generally known in England, though there is another apple frequently ſold in the markets for it, which is what the French call *haute-bonne*. This is a larger fruit than the nonpareil, more inclining to yellow, the ruſſet colour brighter, it is earlier ripe, and ſooner gone. This is not ſo flat as the true nonpareil, nor is the juice ſo ſharp, though it is a good apple in its ſeaſon; but the nonpareil is ſeldom ripe before Chriſtmas, and, when well preſerved, will keep till May perfectly ſound. This is juſtly eſteemed one of the beſt apples yet known.

The golden pippin is a fruit peculiar to England. There are few countries abroad where this ſucceeds well, nor do the trees produce ſo good fruit in many parts of England as could be wiſhed. This is in ſome meaſure owing to their being grafted on free ſtocks, which enlarges the fruit, but renders it leſs valuable; becauſe the fleſh is not ſo firm, nor the flavour ſo quick; it is alſo apt to be dry and mealy. This ſhould therefore always be grafted upon the crab-ſtock, which will not canker like the others; and though the fruit will not be ſo fair to the ſight, yet it will be better flavoured.

Beſides the above variety of apples, there are a great many more; but theſe will be ſufficient to furniſh the table and kitchen during the whole ſeaſon of fruits. And with regard to the apples chiefly preferred for making cyder, they will be enumerated under that article. *See* CYDER.

All ſorts of apples are propagated by grafting, or budding upon the ſtocks of the ſame kind, for they will not take on any other ſort of fruit-tree. In the nurſeries there are three ſorts of ſtocks generally uſed to graft apples upon; the firſt are called free-ſtocks, which are raiſed from the kernels of all ſorts of apples indifferently, and theſe are alſo by ſome called crab-ſtocks; for all thoſe trees which are produced from ſeeds, before they are grafted, are termed crabs, without any diſtinction; but ſuch ſtocks as are raiſed from the kernels of crabs preſſed for verjuice, ſhould be preferred. For it is very certain, that by frequent grafting ſome ſorts of apples upon free-ſtocks, the fruits have been rendered larger, but leſs firm, poignant, and of ſhorter duration.

The ſecond ſort of ſtocks is the Dutch creeper; theſe are deſigned to ſtint the growth of the trees, and keep them within compaſs for dwarfs, or eſpaliers.

The third ſort is the paradiſe apple, which is a very low ſhrub, and therefore only proper for trees which are kept in pots by way of curioſity, for theſe do not continue long.

Some perſons have made uſe of codlin ſtocks for grafting of apples, in order to ſtint their growth; but as theſe are commonly propagated by ſuckers, it is not adviſable to uſe them. Nor are the codlin trees raiſed from ſuckers equal to thoſe grafted upon crab ſtocks; for the fruit of the latter will be firmer, laſt longer, and have a ſharper flavour. The trees ſo propagated will alſo laſt much longer ſound, and never put out ſuckers, as the codlins always do, which, if not conſtantly taken off, will weaken the trees, and cauſe them to canker; nor is it only from their roots, but alſo from the knots of the ſtems, that a great number of ſtrong ſhoots are produced, which fill the trees with uſeleſs ſhoots, and render them unſightly, and the fruit ſmall and crumpled.

The method of raiſing ſtocks from the kernels of crabs, or apples, is, to procure them where they are preſſed for verjuice, or cyder; and after they are cleared from the pulp, they may be ſown upon a bed of light earth, covering them over about half an inch thick with the ſame light earth; theſe kernels may be ſown in November or December, where the ground is dry, but in wet ground it will be better to defer it till February; but then the ſeeds muſt be preſerved in dry ſand, and kept out of the reach of vermin; for if mice or rats can get to them, they will devour the ſeeds: there ſhould alſo be care taken of the ſeeds, when ſown, to protect them from thoſe vermin, by ſetting traps, &c. to take them. In the ſpring, when the plants begin to appear, they muſt be conſtantly kept clear from weeds, which, if ſuffered to grow, will ſoon overtop the plants, and ſpoil their growth; if theſe thrive well, ſome of them will be fit to tranſplant into the nurſery the October following; for the ſooner theſe ſeedling plants are removed from the ſeed bed, the leſs danger there will be of their ſhooting down tap-roots, which, in fruit trees, ſhould always be prevented. The ground where theſe young ſtocks are to be planted, ſhould be carefully digged, cleanſed from the roots of all bad weeds, and laid level; then the ſtocks ſhould be planted in rows three feet aſunder, and the plants one foot diſtant in the rows, cloſing the earth pretty faſt to their roots; when the ſtocks are tranſplanted out of the feed bed, the firſt autumn after ſowing, they muſt not be headed; but ſuch as are inclined to ſhoot downward, the tap-root muſt be ſhortened, in order to force out horizontal roots. If the ground is pretty good in which theſe ſtocks are planted, and the weeds conſtantly cleared away, the ſtocks will make great progreſs; ſo that thoſe which are intended for dwarfs, may be grafted the ſpring twelve months after they are planted out of the feed beds; but thoſe which are deſigned for ſtandards, will require two or three years more growth, before they are fit to graft, by which time they will be upwards of ſix feet high. The other neceſſary work to be obſerved while theſe trees remain in the nurſery, the reader will find under the article NURSERY.

If theſe trees are deſigned for eſpaliers in the kitchen garden, and there be a proper extent of ground, it will be proper to plant not only ſuch ſorts as are adapted to the uſe of the table, but alſo a ſufficient number of trees to ſupply the kitchen; but where the kitchen garden is ſmall, the latter muſt be ſupplied from ſtandard trees, either from the orchard, or wherever they are planted; but as many of theſe kitchen apples are large, and hang late in the autumn upon the trees, they will be much more expoſed to the ſtrong winds on ſtandard trees, than in eſpaliers, whereby many of the fruit will be blown down before they are ripe, and others ſo bruiſed as to prevent their keeping: the planting of them therefore in eſpaliers, where it can be done, ſhould always be preferred.

The diſtance between theſe trees ſhould not be leſs than twenty-five or thirty feet, for ſuch ſorts as are of moderate growth, if grafted upon crab or free-ſtocks; but the larger growing ſorts ſhould not be allowed leſs room than thirty-five feet, which will be found full near enough, if the ground is good, and the trees properly trained; for as the branches of theſe trees ſhould not be ſhortened, but trained at their full length, ſo in a few years they will be found to meet. Indeed, at the firſt planting, the diſtance will appear ſo great to thoſe perſons who have not obſerved the vigorous growth of theſe trees, that they will ſuppoſe they never can extend their branches ſo far as to cover the eſpalier; but if ſuch perſons will but obſerve the growth of ſtandard trees of the ſame kinds, and remark how wide their branches are extended on every ſide, they will be ſoon convinced, that as theſe eſpalier trees are allowed to ſpread on two ſides only, the progreſs muſt conſequently be greater, as the whole nouriſhment of the roots will be employed in theſe ſide branches, than where there is a greater number of branches on every ſide of the tree, which are to be ſupplied with the ſame nouriſhment.

The trees ſhould not be more than two years growth from the graft, but thoſe of one year ſhould be preferred: be careful that their ſtocks are young, ſound, and ſmooth, free from canker, which have been cut down in the nurſery. When they are taken up, all the ſmall fibres ſhould be entirely cut off from their roots, which, if left on, will turn mouldy and decay, and by that means obſtruct the new fibres in their growth; the extreme parts of the roots muſt be ſhortened, and all bruiſed roots cut off; and if there are any miſplaced roots, which croſs each other, they ſhould alſo be cut away. As to the pruning the head of theſe trees, there needs be nothing more done, than to cut off any branches, which are ſo ſituated, as that they cannot be trained to the line of the eſpalier; in the planting there muſt be care taken not to place their roots too deep in the ground, eſpecially if the ſoil be moiſt, but rather raiſe them on a little hill, which will be neceſſary to allow for the raiſing of the borders afterwards. The beſt ſeaſon for planting theſe trees in all ſoils that are not very moiſt, is, from October to the middle, or latter end of November, according as the ſeaſon continues mild; but ſo ſoon as the leaves fall they may be removed with great ſafety. After the trees are planted, it will be proper to place down a ſtake to each tree, to which the branches ſhould be faſtened, to prevent the wind from ſhaking or looſening their roots, whi h will deſtroy the young fibres; for when theſe trees are planted very early in the autumn, they will ſoon puſh out a great number of new fibres, which, being very tender, are eaſily broken, and the trees thereby greatly injured. If the winter ſhould prove ſevere, it will be proper to lay ſome rotten dung, tanner's bark, or ſome ſort of mulch, about their roots, to prevent the froſt from penetrating the ground, which might damage theſe tender fibres; but the mulch ſhould not be laid before the froſt begins; for if it be laid over the roots ſoon after the trees are planted (as is often practiſed) it will prevent the moiſture from entering the ground, and do much hurt to the trees.

The following ſpring, before the trees begin to puſh, two or three ſhort ſtakes ſhould be driven down on each ſide of the tree, to which the branches ſhould be faſtened down as horizontally as poſſible, never cutting them down, as is by ſome practiſed, for there will be no danger of their putting out branches enough to furniſh the eſpalier, when the trees are once well eſtabliſhed in their quarters.

In the pruning of theſe trees, the chief point is never to ſhorten any of their branches, unleſs there be an abſolute want of ſhoots to fill the places of the eſpalier; for where the knife is much uſed, it only multiplies uſeleſs ſhoots, and prevents their fruiting; ſo that the beſt method of managing theſe trees is, to go over them three or four times in the growing ſeaſon, and rub off all ſuch ſhoots as are irregularly produced, and train the others down to the ſtakes, in the poſition they are to remain; if this be carefully performed in ſummer, there will be little left to be done in the winter; and by bending their ſhoots from time to time as they are produced, there will be no occaſion to uſe force to bring them down, nor any danger of breaking the branches. The diſtance theſe branches ſhould be trained from each other, for the largeſt ſorts of fruits, ſhould be about ſeven or eight inches, and for the ſmaller five or ſix. If theſe plain inſtructions are followed, it will ſave much unneceſſary labour of pruning, and the trees will, at all times, make a handſome appearance; whereas, when they are ſuffered to grow rude in ſummer, there will be much difficulty in bringing down their ſhoots without breaking, eſpecially if they are grown ſtubborn. All the ſorts of apple trees produce their fruit upon curſons, or ſpurs; ſo that theſe ſhould never be cut off, for they will continue fruitful a great number of years. *Miller's Gard. Dict.*

For the method of making the eſpaliers, ſee the article ESPALIER.

And for the method of planting ſtandard trees in orchards, ſee ORCHARD.

APRICOT-TREE, a fruit tree now well known in the Engliſh gardens.

There are about ſeven varieties of apricots cultivated in the Engliſh gardens, viz. 1. The maſculine apricot. 2. The orange apricot. 3. The Algier apricot. 4. The Roman apricot. 5. The Turkey apricot. 6. The Breda apricot. 7. The Bruſſels apricot.

The maſculine is the firſt ripe of all the apricots; it is a ſmall roundiſh fruit, of a red colour towards the ſun; as it ripens the colour fades to a greeniſh yellow on the other ſide. The tree is very apt to be covered with flowers; but as they come out very early in the ſpring, they are frequently deſtroyed by the cold, unleſs the trees are covered to protect them.

The orange is the next ripe apricot; this fruit is much larger than the former, and, as it ripens, changes to a deep yellow colour. The fleſh of this is dry, and not high flavoured; it is fitter for tarts, than for the table.

The Algier is the next in ſeaſon; this is of an oval ſhape, a little compreſſed on the ſides; it turns to a pale yellow, or ſtraw colour, when ripe; the fleſh is dry, and not high flavoured: this, and what is by ſome perſons called the common apricot, are often confounded.

The Roman is the next ripe apricot; this is a larger fruit than the former, and not compreſſed on the ſides; the colour is deeper, and not ſo dry as the former.

The Turkey apricot is yet larger than either of the former, and of a globular figure; they turn to a deeper yellow than the former; the fleſh is firmer, and of an higher flavour than either of the former.

The Breda apricot (as it is called from its being brought from thence into England) was originally brought from Africa:

Africa: this is a large, roundiſh fruit, changing into a deep yellow, when ripe; the fleſh is ſoft, full of juice, and of a deep orange colour on the inſide; the ſtone is rounder and larger than that of the other ſorts: this is the beſt apricot we have; and, when ripened on a ſtandard, is preferable to all other kinds.

The Bruſſels is the lateſt ripe of all the apricots; for, when it is planted againſt a wall, it is generally the beginning of Auguſt before it is ripe, unleſs when it is planted to a full ſouth aſpect; which is what ſhould not be practiſed, becauſe the fruit is never well taſted which grows in a warm expoſure. This fruit is of a middling ſize, rather inclining to an oval figure; red on the ſide next the ſun, with many dark ſpots, and of a greeniſh yellow on the other ſide; the fleſh is firm, and of an high flavour; the fruit often cracks before it is ripe.

Moſt people train theſe trees up to ſtems of ſix or ſeven feet high, or bud them upon ſtocks of that height; but this is a practice that ſhould not be recommended, becauſe the higher the heads of theſe trees are, the more they are expoſed to the cutting winds in the ſpring, which too frequently deſtroy the bloſſoms; and the fruit is alſo more liable to be blown down in ſummer, eſpecially if there ſhould happen to be much wind at the time they are ripe; which, by falling from a great height, will be bruiſed and ſpoiled; therefore half ſtandards, of about two and a half, or three feet in the ſtem ſhould be preferred to thoſe which are much taller.

Theſe fruits are all propagated by budding them on plum ſtocks, and will readily take upon almoſt any ſort of plum, provided the ſtock be free and thriving (except the Bruſſels kind, which is uſually budded on a ſort of ſtock, commonly called the St. Julian, which better ſuits the tree, as being generally planted for ſtandards, than any other ſort of plum will.) The manner of raiſing the ſtocks, and budding theſe trees, are treated of under their particular articles.

Theſe trees are all (except the two laſt ſorts) planted againſt walls, and ſhould have an eaſt or weſt aſpect; for, if they are planted full ſouth, the great heat cauſes them to be mealy before they are well eatable. The borders under theſe walls ſhould be ſix feet wide at leaſt, and, if it were more, the better; but they ſhould never be made ſo deep, as is the general cuſtom; for, if the earth be two feet deep, or two and a half at moſt, it is enough.

If your ground is a wet cold loam or clay, you ſhould raiſe your borders as much above the level of the ſurface as it will admit, laying ſome ſtones or rubbiſh in the bottom, to prevent the roots from running downwards; but, if you plant upon a chalk or gravel, it will be better to raiſe the borders to a proper thickneſs with good loamy earth than to ſink the borders by removing the chalk or gravel.

The beſt ſoil to be uſed for theſe and all other ſorts of fruit trees, is freſh untried earth, from a paſture ground, taken about ten inches deep, with the turf, and laid to rot and mellow at leaſt twelve months before it is uſed; and this muſt be kept often turned, to ſweeten and imbibe the nitrous particles of the air.

Your borders being thus prepared, make choice of ſuch trees as are but of one year's growth from budding; and, if your ſoil is dry, or of a middling temper, you ſhould prefer October for the beſt ſeaſon for planting, eſpecially having, at that time, a greater choice of trees from the nurſeries, before they have been picked and drawn over by other people. The manner of preparing theſe trees for planting being the ſame in common as other fruit trees, we refer the reader to the article Peaches.

But do not cut off any part of the head at that time, unleſs there are any ſtrong fore-right ſhoots which will not come to the wall, which may be taken quite away.

Your trees being thus prepared, you muſt mark out the diſtances they are to ſtand, which, in a good ſtrong ſoil, or againſt a low wall, ſhould be twenty feet, or more: but, in a moderate ſoil, and againſt taller walls, eighteen feet is a good reaſonable diſtance; then make an hole where each tree is to ſtand, and place its ſtem about four inches from the wall, inclining the head thereto: and, after having fixed the tree in the ground, nail the branches to the wall, to prevent their ſhaking. In this ſtate let it remain till the middle of March, when, if the weather is good, you muſt unnail the branches of your trees, ſo as not to diſturb the roots, and, being provided with a ſharp knife, put your foot cloſe to the ſtem of the tree; and, having placed your left-hand to the bottom of the tree, to prevent its being diſturbed, with your right-hand cut off the head of the tree, if it has but one ſtem, or where it may have two or more ſhoots, each of them muſt be ſhortened to about four or five eyes above the bud, ſo that the ſloping ſide may be towards the wall.

In the ſpring, if the weather proves dry, you muſt, now-and-then, give your trees a gentle refreſhing with water all over their head, which will greatly help them; and alſo lay ſome turf, or other mulch, round their roots, to prevent their drying during the ſummer-ſeaſon: as new branches are produced, obſerve to nail them to the wall in an horizontal poſition; and ſuch ſhoots as are produced fore-right, muſt be intirely diſplaced. This muſt be repeated, as often as is neceſſary, to prevent their hanging from the wall; but by no means ſtop any of their ſhoots in ſummer.

At Michaelmas, when the trees have done growing, you muſt unnail their branches, and ſhorten them in proportion to their ſtrength; a vigorous branch may be left eight or nine inches long, but a weak one ſhould not be left above five or ſix.

When you have ſhortened the ſhoots, be ſure to nail them as horizontally as poſſible; for upon this it is that the future good of the tree chiefly depends.

The ſecond ſummer obſerve, as in the firſt, to diſplace all fore-right ſhoots, as they are produced, nailing in the other cloſe to the wall horizontally, ſo that the middle of the tree may be kept open; and never ſhorten any of the ſhoots in ſummer, unleſs to furniſh branches to fill vacant places on the wall; and never do this later than April. At Michaelmas ſhorten theſe ſhoots, as was directed for the firſt year; the ſtrong ones may be left nine or ten inches, and the weak, ſix or ſeven at moſt.

The following year's management will be nearly the ſame with this; but only obſerve, that apricots produce their bloſſom-buds, not only upon the laſt year's wood, but alſo upon the curſons or ſpurs, which are produced from the two year's wood: great care ſhould therefore be had in the ſummer management, not to hurt or diſplace theſe: obſerve alſo to ſhorten your branches at the winter pruning, ſo as to furniſh freſh wood in every part of the tree.

Theſe few rules, well executed, together with a little obſervation and care, will be ſufficient; and, to pretend to preſcribe particular directions for all the different accidents, or manners of treating fruits, would be impoſſible; the reader will find what has been ſaid, if duly attended to, ſufficient.

The Bruſſels and Breda apricots, being, for the moſt part, planted for ſtandards, will require very little pruning or management; only obſerve to take out all the dead wood, or ſuch branches as croſs each other; this muſt be done early in autumn, or in the ſpring, after the cold weather is paſt, that the part may not canker where the inciſion is made. *Miller's Gard. Dict.*

APRIL, the fourth month of the civil year, conſiſting of thirty days.

This month is the beſt month, if the weather be dry, to ſow barley and white oats, to deſtroy weeds, and alſo to fallow land.

Fell the timber you intend to bark, if the ſpring be forward: cleanſe and rid your coppices, and preſerve them from cattle: keep geeſe and ſwine out of commons and paſtures, and water new planted trees, if the weather prove dry.

Pick up ſtones on the new ſown land: ſow hemp and flax.

Cleanſe ditches, and get in your manure that lies in the ſtreets or lanes, or lay it in heaps.

Set oſiers, willows, and other aquatics, before they are too forward, and alſo ſlips of roſemary or lavender.

You may throughout this month ſow clover graſs, St. Foyn, and all French and other graſſes, or hays: plant

plant madder, and be selling of your winter fed cattle. *Mortimer's Husbandry.*

AQUATICS, or *aquatic* plants, such plants and trees as grow in water.

Thus, the willow, osier, water-cresses, brook-limes, &c. are aquatics.

ARABLE *land*, such land as is tilled, or cultivated for the production of corn.

ARAIRE, the name of a small plough used in Provence and Languedoc, in France.

It consists of a ground wrist, *a*, *b*, (Plate I. Fig. 3.) from three to four feet long, ending in a point towards *b*. The under part of this wrist, instead of being flat, is formed into a ridge, which extends the whole length of it.

This ground wrist, at the end *a*, terminates in a strong tenon fixed in a large mortise, formed at the extremity *d* of the beam *d e*, and is besides fastened to the beam by two iron uprights *f g*, which have a head at *g*, and going through the beam are keyed at *f*: the distance between the under part of the beam about *f*, and the upper part of the ground wrist towards *g*, is about fifteen inches. Instead of these uprights there is sometimes put a piece of sharpened wood or iron, as represented by the pricked line *h g*, which serves instead of a coulter.

On the upper part of the ground wrist is fixed a large iron share *d b* (Fig. 4). the part *d i*, is received into the same mortise of the extremity *d* (Fig. 3.) in which the tenon of the ground wrist is fastened; and the wings of the share *k l* (Fig. 4.) rest upon the iron uprights *f g* (Fig. 3.)

On the hindermost part of this plough is a single lever *m d* (Fig. 3.) which serves for a handle: at the end *d*, where it is bent, it enters, as well as the ground wrist and share, into the great mortise *d*, at the end of the beam; and the whole is secured with wedges. The handle sometimes consts of two pieces lapped one over the other, as at *n*, to lengthen or shorten it, according to the height of the ploughman.

By means of the wedges just mentioned, the angle which the ground wrist forms with the beam, may be altered at pleasure, which makes it plough more or less deep. At the hinder parts of the ground wrists are two earth boards, fastend at *o*, by a strong wooden pin, which passes through both the boards and the ground wrist.

The beam *d*, *f*, *e*, which is from eight to ten feet long, has an iron bolt at the end *e*, which enters with great ease into a large mortise made at the extremity *g*, of the piece of wood *q* 5 *r*, intended to pass between the oxen, and to which their harness is to be fastened. When a single horse is used in the plough, a shaft is substituted instead of the piece of wood *q* 5 *r*, and fastened to the end of the beam *e*, by an iron ringlet.

It is evident that this plough goes a greater or less depth, according as the draught is more or less raised. The ploughman, as has been already observed, can alter the angle which the ground wrist forms with the beam, by means of the wedges he drives into the mortise of the beam, which receives both the ground wrist and handle. But these directions not being sufficiently exact, it is necessary that the ploughman should lean on the handle *m*, when it cuts too deep, and raise it when it makes too shallow a furrow: this labour is so constant, that were the plough to work in a strong soil, the ploughman could not support it. The two little earth boards *p p*, turn over to the right and left the earth that has been loosened by the share; but this is not done so regularly, as when there is but one earth board, which throws the earth into the furrows before made, as fast as it comes out of that which the plough is forming: it is however certain, that the ground wrist being ridged, the ploughman always rests it on one side, which occasions the greater part of the earth to be thrown one way.

These ploughs having no coulters, the earth is not cut vertically at all: for neither the piece of sharpened wood, nor the sheath which joins the ground wrist to the beam, and which is placed a little before the small iron bars *f*, *g*, can be esteemed a coulter. The bar represented by the pricked line *h g*, may serve instead of a coulter, but it must then be made of iron; and in this case the coulter would be very improperly situated, for it should by rights be before the share.

These ploughs are very convenient to use among trees, or in vineyards: they may also serve to stir the ground in the intervals between the rows of saintfoin and lucerne; but then should be rather called cultivators, than ploughs. *Du Hamel's Elemens d'Agriculture.*

ARCHIMEDES's *screw*, a kind of spiral pump, for raising water, so called from Archimedes, its inventor.

It consists of a long cylinder, with a hollow pipe, tube, or groove coiled round it, as represented on Plate I. Fig. 5. where A B shews the cylinder, and C D the tube open at each end. It is placed in an oblique position to the horizon, with the lower end in the water to be raised, and the other supported by the pivot below the winch J K, by which the tube and cylinder are turned round.

As soon as the screw is immersed in the water, it immediately rises therein by the orifice C, to the level of the surface of the water E F; and if the point of the spiral tube, which in the beginning of the motion is coincident with the surface of the water, happens not to be on the lower side of the cylinder, the water will, upon the motion of the screw, move on the spiral tube, till it comes to the point which is on the other side, and coincident with the surface of the water; when it is arrived at that point, as suppose at O, it cannot afterwards possess any part of the spiral, but that which is upon the lowest part of the cylinder; for it cannot move from O towards H or G, because they are situated higher above the horizon; and since this will constantly be the case, after the water in the spiral has obtained the point O, it is plain that it must always be on the under part of the cylinder.

But because the cylinder is in motion, every part of the spiral screw from O to D, will, by degrees, succeed to every part thereof from O to D, as it comes on the lower side; that is, it must ascend on the lower part of the cylinder through all the length of the pipe, till it comes to the orifice at D, where it will run out, as having nothing farther to support it.

This engine may be very useful in raising water, foul with sand, &c. as the leathers of pumps will be soon destroyed by these particles. And it was principally this reason that induced the ingenious Mr. Smeaton to erect a machine of this kind in the gardens of her royal highness the princess dowager of Wales at Kew, where it is worked by horses, and supplies all the ponds, &c. in that extensive garden with water. A machine of this kind, turned by a wind-mill, might be of great use in draining lands in several parts of England, as it is not subject to be out of order, and might be made to raise a very large quantity of water to a small height. We shall describe several other contrivances for this purpose when we come to treat of draining of lands, there being many very curious and useful engines of this kind deposited in the machine room of the society for the encouragement of arts, &c. *See the article* DRAINING *of* LANDS.

ARDERS, fallowings, or plowings of land.

ARK, a large chest to put corn or fruit in, like the bin of a buttery.

ARLES, or EARLES, earnest; thus an arles-penny, signifies an earnest penny.

AROMATIC, an epithet applied to such plants, and other bodies, as yield a fine fragrant smell, and have a warm spicy taste.

ARPENT, the French name for an acre. *See* ACRE.

We have already observed under the article *acre*, that the French arpent contains 100 perches of twenty-two French square feet, which is equal to about one acre and three quarters of a rood English measure. But it may be necessary to add here, that the French have three different arpents, distinguished by the epithets *little*, *middle*, and *great* arpent.

The little ARPENT contains 100 perches of eighteen feet and a half square; consequently its superficial measure is 32,400 French feet, equal to 34,603 feet, or three rood, seven perches, and twenty-seven feet English measure.

The middle ARPENT, confifts alfo of 100 perches, twenty feet fquare, which make 40,000 French feet fuperficial meafure; equal to 42,720 feet, or three rood, thirty-fix perches, and 149 feet Englifh meafure.

The great ARPENT, contains ten perches of twenty-two fquare perches. *See the article* ACRE.

ARTICHOKE, a plant well known in the Englifh gardens, where there are two forts cultivated, namely, the globe artichoke, and the French artichoke.

The globe artichoke is much the better plant. This hath large heads, with brown fcales, which turn inward: the flefhy part at the bottom of the fcales is very thick, and therefore preferred to the French artichoke, whofe ftalks generally grow higher; but the head fmaller, and of a more conical form, than thofe of the globe. The fcales alfo are narrower, of a greener colour, and frequently turned outward. The flefhy part, which is eaten, is not near fo thick, and hath a difagreeable perfumed tafte. This fpecies was almoft wholly deftroyed in the Englifh gardens during the hard froft in 1739-40.

The manner of propagating this plant is from flips or fuckers taken from the old roots, in February or March, which, if planted in a good foil, will produce large fair fruit the autumn following.

About the beginning of March, according to the goodnefs of the feafon, or forwardnefs of the old artichoke ftocks, will be the proper time of dreffing them, which muft be thus performed: with your fpade remove all the earth from about your ftock, down below the part from whence the young fhoots are produced, clearing the earth from between the fhoots, fo as to be able to judge of the goodnefs of each, with their proper pofition upon the ftock; then make choice of two of the cleareft, ftraiteft, and moft promifing plants that are produced from the under part of the ftock, which you are to let remain for a crop; then with your thumb force off all the other plants and buds, clofe to the head of the ftock, from whence they are produced, being very careful not to leave any of the buds, and with your fpade draw the earth about the two plants which are left, and with your hands clofe it faft to each of them, feparating them as far afunder as they can conveniently be placed without breaking them, obferving to crop off the tops of the leaves, which hang down, with your hands: your ground being levelled between the ftocks, you may fow thereon a fmall crop of fpinage, which will be taken off before the archichokes will cover the ground; and be fure to keep them clear from weeds; and towards the latter end of April, or the beginning of May, when your plants begin to fhew their fruit, you muft carefully look over your ftocks, and draw up all young plants from them, which may have been produced fince their dreffing, and cut off all fuckers which are produced from the ftems of the artichokes, leaving only the principal head, by which means your fruit will be larger: when your artichokes are fit to gather, you muft break, or cut them down clofe to the furface of the ground, that your ftocks may make ftrong frefh fhoots by the middle of November, which is the feafon for earthing, or, as the gardeners term it, landing them up: which is thus done:

Cut off all the young fhoots quite clofe to the furface of the ground; then dig between every ftock, raifing all the earth between each row of ftocks into a ridge, as is done in the common method of trenching ground, fo as that the row of artichokes may be exactly in the middle of each ridge; this will be fufficient to guard them againft froft: and I would here recommend it to the public, as infinitely preferable to long dung, which is by the unfkilful often ufed to cover the roots, and is the occafion of their fruit being fmall, and almoft without any bottoms to them. Obferve, that, although I have mentioned November as the feafon for earthing them, yet, if the weather proves mild, it may be deferred till any time in December.

When you have thus earthed them up, you have nothing more to do till February or March, by which time they will have grown through the ridge of the earth; and, when the weather is proper, muft be dreffed as was before directed.

When you have a mind to make a new plantation of artichokes, after having digged in and buried fome very rotten dung in the ground you have allotted for that purpofe, make choice of fuch of your plants, taken from your old ftocks, as are clear, found, and not woody, having fome fibres at the bottom; then with your knife cut off that knobbed woody part, which joined them to the ftock; and if that cuts crifp and tender, it is a fign of its goodnefs; but if tough and ftringy, throw it away as good for nothing: then cut off the large outfide leaves of the plants, intended for fetting, pretty low, that the middle or heart leaves may be above them.

Your plants being thus prepared (if the weather be very dry, or the plants have been any time taken from the ftocks, it will be convenient to fet them upright in a tub of water for three or four hours before they are planted, which will greatly refrefh them) you muft then proceed to planting, which muft be done by ranging a line acrofs the ground, in order to their being placed exactly in a row, and, with a meafure-ftick, plant them at two feet diftance from each other in the rows, and, if defigned for a full crop, five feet diftance from row to row: your plants muft be fet about four inches deep, and the earth clofed very faft to their roots; obferving, if the feafon proves dry, to keep them watered two or three times a week, until they are gowing, after which they do not require any.

Thefe plants in a kindly feafon, or on a moift foil, will produce the largeft and beft artichokes fome time in Auguft and September, after all thofe from the old ftocks are paft; fo that if you intend to continue your artichokes through the whole feafon, you muft make a new plantation every year, otherwife you cannot poffibly have fruit longer than two or three months.

Thofe artichokes which are planted in a moift rich foil, will always produce the largeft and beft fruit; fo that where fuch a foil can be obtained, it will be proper to make a frefh plantation every fpring, to fucceed the old ftocks, and fupply the table in autumn. But the roots will not live through the winter in a very moift foil; fo that your ftocks which you intend fhould remain to fupply the table early, and to furnifh plants, fhould be in a drier fituation. You fhould always obferve to plant artichokes in an open fpot of ground, not under the drip of trees, where they will draw up very tall, and produce only fmall infignificant fruit. *Miller's Gard. Dict.*

That ingenious cultivator M. de Chateauvieux, has raifed excellent artichokes in the open field, without dunging the ground, or even watering the plants, merely by a thorough ftirring of the earth, according to the principles of the new hufbandry. "Artichokes, fays that ingenious gentleman, planted at the beginning of May, produced, in September, their firft fruit, which was, in general, from twelve to fifteen inches in circumference. Their leaves entirely covered the beds fix feet wide."

Jerufalem ARTICHOKE, a fpecies of the fun flower, of the perennial kind, propagated in many gardens for the roots, which are efteemed by fome people; but they are watery and windy, which hath brought them almoft into difufe.

Thefe are propagated by planting the fmaller roots, or the larger ones cut into pieces, obferving to preferve a bud to each feparate piece, either in the fpring or autumn, allowing them a good diftance, for their roots will multiply greatly: the autumn following, when their ftems decay, the roots may be taken up for ufe. Thefe plants fhould be cultivated in fome remote corner of the garden, for they are very unfightly while growing, and their roots are apt to over-run whatever grows near them; nor can they be eafily deftroyed, when they are once well fixed in a garden. *Miller's Gard. Dict.*

ARTIFICIAL GRASSES, fuch as are introduced into the field with great care, and cultivated afterwards with great diligence. Such as burnet, clover, lucern, faintfoin, ray-grafs, fpurry, &c. *See the method of cultivating each under its proper article.*

ARTIFICIAL PASTURES, fuch lands as are properly cultivated and fown with the above plants, or any other that yield a great deal of fodder for cattle.

ASCARIDES,

ASCARIDES, ſmall worms common in horſes, reſembling needles, ſome of them white, and ſome of an azure colour, with flattiſh heads. They are often called needle-worms by the farriers.

Theſe worms are very troubleſome, and hard to be rooted out, and expoſe horſes to frequent gripes, and other fretting uneaſy diſorders in their guts. They breed at all times of the year, and often when one brood is deſtroyed another ſucceeds. They are not mortal; but when a horſe is peſtered with this ſort of vermin, though he will go through his buſineſs tolerably well, and ſometimes feed heartily, yet he always looks lean and jaded; his hair ſtares as if he was ſurfeited, and nothing he eats makes him thrive; he oftens ſtrikes his hind-feet againſt his belly, which ſhews where his grievance lies, and is ſometimes griped, but without the violent ſymptoms that attend a cholic, or ſtrangury, for he never rolls or tumbles, but only ſhews uneaſineſs, and generally lays himſelf down quietly on his belly for a little while, and then gets up and falls a feeding; but the ſureſt ſign is when he voids them with his dung.

Theſe ſmall worms ſometimes come away in great numbers with a purge, and ſome horſes get clear of them by purges only; but this does not often happen; for the horſes that breed aſcarides are, above all others, ſubject to ſlime and wormy matter. They ſeem to have their lodgment about the beginning of the ſmall guts, near the ſtomach, among the concocted aliment or chyle, both from their colour, the ſymptoms of the gripes, and the ſudden fits of ſickneſs theſe horſes are often ſeized with, which ſometimes make them abruptly leave off their food, for a few minutes, and fall greedily to it again as ſoon as the ſick fit is over. They are ſeldom ſeen, except when a horſe has had a purge given, or when he falls into a natural purging, which thoſe horſes are often ſubject to, and then they come away in very great numbers, with much ſlime and naſtineſs. They not only make a horſe grow lean, and look ſurfeited; but in opening his mouth, one may perceive a more than ordinary languid whiteneſs, and a ſickly ſmell, from the want of thoſe due ſupplies of blood and nouriſhment, which give a livelineſs to the colour that is always perceivable in ſound vigorous horſes; ſo that whatever be the primary cauſe, theſe worms ſeem, in a great meaſure, to proceed from a vitiated appetite, and a weak digeſtion, which renders them the more difficult to be removed; for which reaſon recourſe muſt be firſt had to mercurials, and after theſe, to ſuch things as are proper to ſtrengthen the ſtomach, promote digeſtion, and give a better tone to the ſolids.

To a horſe, therefore, that is troubled with theſe ſmall white, or azure coloured worms, the following method may be obſerved:

"Take of calomel that has been often ſublimed and well prepared, two drams; diapente half an ounce; make it into a ball, with a ſufficient quantity of conſerve of wormwood, or of rue, and give it in the morning, keeping the horſe from meat and water four hours before, and four hours after taking it."

The next morning adminiſter the following purge, taking great care to keep the horſe from wet, or from any thing that may expoſe him to catch cold.

"Take Barbadoes, or plantation aloes, one ounce; ſalt of tartar, two drams; freſh ginger grated, a dram and a half; oil of amber a middling ſpoonful: make the whole into a ball with flour or liquorice powder."

This purge may be worked off in the ſtable with warm water, which is much the ſafeſt way when mercurials are given. The calomel ball and purge may be repeated in ſix or eight days; and again in ſix or eight days more.

When a horſe has gone through a courſe of theſe mercurials purges, let the following drink be given two or three times a week, and continued till the horſe begins to thrive and look healthful.

"Take rue, camomile flowers, and horehound, of each a handful; galangals, bruiſed in a mortar, three drams; liquorice root, ſliced, two drams: boil it in a quart or three pints of forge-water five or ſix minutes, in a covered veſſel, and keep it covered till cold: then ſtrain it through a piece of coarſe canvas, and give it in the morning upon an empty ſtomach." *Gibſon on the Diſeaſes of Horſes.*

ASH, or ASH-TREE. There are ſeveral ſpecies of the aſh-tree cultivated by curious perſons for the ſake of variety; but what deſerves attention in a work of this kind, is the common aſh, called by botaniſts, *fraxinus foliolis ſerratis, floribus apetalis*; and is ſo well known as to need no deſcription.

This tree propagates itſelf in plenty by the ſeeds which ſcatter in the autumn; ſo that when the ſeeds happen to fall in places where cattle do not come, there will be plenty of plants come up in the ſpring; but when any perſon is deſirous of raiſing a quantity of the trees, the ſeeds ſhould be ſown as ſoon as they are ripe, and then the plants will come up the following ſpring; but if the ſeeds are kept out of the ground till ſpring, the plants will not come up till the year after; the ground therefore ſhould be kept clean all the ſummer where they are ſown, and not diſturbed, leſt the ſeeds ſhould be turned out of the ground, or buried too deep to grow.

When the plants are come up, they muſt be kept clean from weeds during the ſummer; and, if they make good progreſs in the ſeed-bed, they will be fit to tranſplant by the following autumn; ſome ground ſhould, therefore, be prepared to receive them; and as ſoon as their leaves begin to fall, they ſhould be tranſplanted. In taking of them up care ſhould be taken not to break or tear off their roots; to prevent which they ſhould be taken up with a ſpade, and not drawn up, as is frequently practiſed; for as many of the plants which riſe firſt from ſeeds will out-ſtrip the others in their growth, ſo it is frequently practiſed, to draw up the largeſt plants, and leave the former to grow a year longer, before they are tranſplanted; and to avoid hurting thoſe that are left, the others are drawn out by hand, and thereby many of their roots are torn off, or broken. It is, therefore, much the better way to take all up, little or big, together, and tranſplant them out, placing the large ones together in rows, and the ſmall ones by themſelves. The rows ſhould be three feet aſunder, and the plants a foot and a half diſtance in the rows. In this nurſery they ſhould remain two years, by which time they will be ſtrong enough to plant where they are to remain, for the younger they are planted out the larger they will grow; ſo that where they are deſigned for uſe, they ſhould be planted very young; nor ſhould the ground where they are raiſed be better than that where they are deſigned to grow. For when any plants are raiſed in good land, and afterwards planted into worſe, they very rarely thrive; ſo that it is much the better method to make the nurſery upon a part of the ſame land, where the trees are deſigned to be planted, and then a ſufficient number of the trees may be left ſtanding upon the ground, and theſe will outſtrip thoſe which are removed, and grow to a larger ſize.

Where people live in the neighbourhood of aſh-trees, they may ſupply themſelves with plenty of ſelf-ſown plants, provided cattle are not ſuffered to graze on the land; for if cattle can come at them, they will eat off the young plants, and not ſuffer them to grow; but where the ſeeds fall in hedges, and are protected by buſhes, the plants will come up and thrive: in theſe hedges the trees are frequently permitted to grow till they have deſtroyed the hedge, for there is ſcarce any tree ſo hurtful to all kinds of vegetables as the aſh, which robs every plant of its nouriſhment within the reach of its roots, and ſhould therefore never be ſuffered to grow in hedge-rows; for they not only kill the hedge, but impoveriſh corn, or whatever is ſown near them. Nor ſhould any aſh-trees be permitted to grow near paſture grounds, for if any of the cows eat of the leaves or ſhoots of the aſh, all the butter that is made of their milk will be rank, and of little or no value. In all good dairy countries therefore they never ſuffer any aſh-trees to grow.

If the wood of theſe trees be rightly managed, it will turn greatly to the advantage of its owner; for by the under wood, which will be fit to cut every eight or ten years, there will be a continual income more than ſufficient to pay the rent of the ground, and all other charges; and ſtill there will be a ſtock preſerved for timber, which

which in a few years, will be worth forty or fifty ſhillings per acre.

This timber is of excellent uſe to the wheelwrights and cartwrights for ploughs, axle-trees, fellies of wheels, harrows, oars, blocks for pullies, and many other purpoſes.

The beſt ſeaſon for felling theſe trees is from November to February; for if it be done either too early in the autumn, or too early in the ſpring, the timber will be ſubject to be infeſted with worms, and other inſects: but for lopping of pollards the ſpring is preferable for all ſoft wood. *Miller's Gard. Dict.*

ASHES, the earthy particles of combuſtible ſubſtances remaining after they have been burnt.

If the aſhes are produced from vegetable bodies, they contain a conſiderable quantity of fixed ſalt, blended with the earthy particles, and from theſe particles, the alcaline ſalts, called pot-aſh, pearl-aſh, &c. are extracted.

Aſhes of all ſorts contain in them a very rich fertile ſalt, and are the beſt manure of any to lay upon cold lands, eſpecially if kept dry, and the rain doth not waſh away their ſalts. One load of dry aſhes will go as far as two not kept ſo. But as rain water diminiſhes their ſalts, ſo the moiſtening them with chamber-lie, or ſoap-ſuds, will add greatly to their ſtrength. Two load of theſe aſhes will manure an acre of land better than ſix load of thoſe that are expoſed to the rain, and that are not ordered ſo, which is the common allowance for an acre, though ſome lands require more, and ſome leſs. That the aſhes of any ſort of vegetables are very advantageous to land, is what is experienced in moſt places of England, by the improvement that is made by burning of fern, ſtubble, ſtraw, heath, furze, ſedge, bean-ſtalks, &c. *Mortimer's Huſbandry.*

Coal ASHES from their calcarious quality, are ſingularly beneficial to ſtiff and ſour land, for which purpoſe they are ſucceſsfully uſed in the neighbourhood of ſome great cities, where coal is burnt for fuel. They open clayey grounds, and correct their bad qualities. The gardeners and farmers about London know their value, and make a very profitable uſe of them, particularly to bring into order thoſe grounds which have been dug for brick earth. After ſpreading theſe aſhes upon the clay bottom, they either ſow horſe-beans, or ſet the early Spaniſh, and ſometimes the Windſor-bean in thoſe ſpots; or elſe they lay ſuch lands down with rye-graſs, which generally ſucceeds very well. Mr. Bradley blaming the people of Staffordſhire, and the counties adjoining, where there are coal-pits, for not improving their heavy grounds around thoſe pits, by manuring them with coal aſhes, which might be eaſily burnt out of the waſte coals, ſays, "that wherever there are plenty of coal-pits, there can be no want of good profitable land." *Bradley's Huſbandry.*

Mr. Mortimer agrees entirely with Mr. Bradley, eſteeming ſea-coal aſhes as the beſt manure of any for cold lands, the moſt laſting, and the fitteſt to kill worms. Their ſharp and drying quality opens the pores of ſtiff ſoils, and diſcharges a great deal of their viſcous quality. Mr. Worlidge looks upon them as an excellent compoſt when mixed with horſe dung; he adds, that they are a great curer of moſs and ruſhes in moſt grounds. *Worlidge's Huſbandry.*

Kiln ASHES, made of ſtraw, furze, &c. are a good manure for almoſt any kind of ſoil. In the weſt of England farmers ſift them over their corn and graſs; but this muſt not be done in windy weather, becauſe they are ſo very light that they would be eaſily blown away. They ſucceed beſt when laid on juſt before rain or ſnow. *Mills's Huſbandry, vol.* I.

Peat ASHES are likewiſe a very good manure. Mr. Miller is of opinion, that they are greatly bettered by being mixed with lime before they are laid on the land.

Mr. Ellis has rightly obſerved, that there is a conſiderable difference between the aſhes of lean peat, and thoſe produced by the fatter kind. If barley, ſays he, be ſown ſo late as the beginning of May, lean peat aſhes in particular may be applied over it, or harrowed in with the grain; but aſhes burnt from fat black peat, ſuch as is dug at Newbury, are of ſo ſulphureous a nature, that farmers are afraid to lay them on their barley; nor do they dreſs their wheat with them till the ſpring is advanced, and then they are ſown over it.

The earth of which this rich manure is made, is taken from a black mooriſh ground, with a narrow wood ſcoop, which brings it out like a long brick. Theſe pieces of ſwampy earth are laid on the ground to dry in the ſummer; after which they ſell for eight ſhillings a waggon load, for fuel. But when they are to be uſed for manure, after being dried, they are burnt in heaps of ten, twenty, or thirty loads, laying on more peat upon the outſides, as the fire increaſes within, to keep it from having too much vent.

The great uſe of theſe aſhes was diſcovered about fifty years ago; but they ſoon fell into diſrepute, owing to the injudicious management of people, who imprudently laid on too great quantities of them at a time, by which means the corn was burnt. Afterwards they found that ſix, or at moſt ten buſhels, were ſufficient to be ſown over an acre of wheat, peaſe, turnips, clover, rape-ſeed, or ſaintfoin, as early as could conveniently be done. But ſtill many are afraid to ſow them over barley, leſt a dry ſeaſon ſhould enſue, and burn it up: for theſe aſhes are thought to contain three times as much ſulphur as there is in coal aſhes. This is reaſonably ſuppoſed from their very ſtrong ſulphureous ſmell; their ſparkling and jumping when ſtirred while burning, and their drying up corn by their too great heat. Theſe peat aſhes, as likewiſe thoſe of wood or coal, will help to keep off the ſlug from peaſe and other grains, by the ſalt and ſulphur contained in them, and conduce very much to their preſervation in cold wet ſeaſons. But no danger of over-heating need be feared from the aſhes of that peat which grows, as turf, over ſandy bottoms, as great quantities do on Leighton-heath in Bedfordſhire; for theſe are as much too lean, as the others are too rank. *Ellis's Modern Huſbandman, vol.* II.

We muſt not here omit the account the ingenious Mr. du Hamel has given of a kind of peat aſhes made in France, as the ſame kind of earth with that from whence they are burnt, may be doubtleſs found in many parts England, if farmers would give themſelves the trouble to ſearch for it.

This peat is a blackiſh earth, reſembling the ſoil of ſome meadows. When burnt it emits a thick, diſagreeable ſulphureous vapour. A certain degree of moiſture helps to make it burn, though even then it waſtes but ſlowly. After it has once taken fire it burns of itſelf, but without producing any flame. It is of ſo cauſtic a nature, that it would ſtrip off the ſkin of the hands and feet of the men who knead it, if they did not take proper precautions againſt that inconvenience. Its aſhes retain this cauſtic quality; for the hands of thoſe peaſants who ſtrew them are often hurt by it, if the air be at all damp. This earth, in its natural poſition runs in veins of different ſizes; ſometimes ſeven or eight feet thick, and thirty or forty feet long; and ſometimes they extend four or five hundred feet; after which the vein often fails at once, and perhaps is not found again till two or three miles off. Theſe veins generally lie pretty near the ſurface of the earth, ſeldom deeper than twelve or fifteen feet.

This earth is found only in marſhy places, which muſt ſometimes be drained before it can be come at. It ſhews itſelf by a ſlimy ſkin over the adjacent waters.

Three pounds of this earth being diſtilled in a retort, produced fifteen ounces of a bituminous oil, reſembling that extracted from pit-coal; and the reſiduum yielded, when waſhed, about half a pound of vitriol.

The method of preparing this earth, in order to render it fit for fertilizing land, is as follows: water is thrown over it, and two or three men knead it with their feet, till they bring it to the conſiſtence of a paſte, which is then made into cakes ſeven or eight inches in diameter. Theſe cakes are laid by to dry, though not to ſuch a degree but that there ſtill remains a little moiſture in them, that being neceſſary to facilitate their burning.

The cakes thus prepared are piled up in the form of a pyramid, with ſufficient ſpaces between them for the fire to penetrate; and under this pyramid, which is built upon a kind of hearth, a little ſtraw and bruſh-wood is laid

laid to set them on fire. Two or three days after their ashes are spread with a rake, that they may cool. Some veins of this earth yield white ashes, but they are not so good as those of a reddish hue.

From fifty to seventy pounds of these ashes are spread upon each acre of land in April or May; and in about a week's time the blades of corn, or grass, if it be pasture ground, assume a new verdure, and appear surprisingly strong, even in the coldest soils.

Some of these bituminous earths are better than others. Care must be taken to begin to rake out the ashes of each pyramid as soon as the greater part of it is burnt; for they would lose a great deal of their virtue, if left on the fire till all that is inflammable be consumed: nor would the fire go out in less than a fortnight or three weeks, if they were not scraped away as they are formed.

It would be needless to mention, that a greater quantity of the ashes of an inferior quality must be used, than of those that are stronger, and consequently better; but it may not be amiss to observe, that, in general, wet lands require more than dry soils. The effects of this manure will be manifest for two or three years. It might be dangerous to renew it every year. *Traitté de la Culture de Terres, tom.* V. *pag.* 226.

Pot ASHES are the refuse or ashes remaining after the salt, called pot ashes, is extracted from them.

These ashes are of great service to most sorts of land; but as they have been in a great measure deprived of their salts, it is necessary to lay them on much thicker than other ashes. A bushel and a half of these may be used for a bushel of fresh ashes: but they should always be mixed with some other light ingredient, which may be used in any quantity, if laid on very stiff land. If the land be not over stiff, they may be laid upon it with less mixture. *Bradley's Husbandry.*

Soap ASHES are a composition of wood ashes and lime, remaining after the soap-makers have drawn off their lye.

They are an excellent manure, and were first used by the Flemings with very great success. Two loads of these ashes are sufficient for an acre of arable land; and by the assistance of this manure the ground will not only yield a large crop, but may be sown yearly, without leaving it fallow at any time. They should be laid on the ground in the beginning of winter, that the rain may more easily dissolve and wash them in. Sir Hugh Platt tells us, that by manuring a piece of barren land at Bishop's-hall in Middlesex, in the year 1594, he obtained an excellent crop of summer barley; that he measured the stalk and ear of one of these plants, and found it to be an ell and three inches in length, from the ground to the summit of the ear. We have given a figure of this ear of summer barley in its natural size, on Plate III. Fig. I. *Platt's Jewel-house of Art and Nature.*

A writer in the *Museum Rusticum* declares, that he has for many years past received great benefit by using soap ashes as a manure, with which he almost constantly dresses his wheat lands; but never uses it alone, on account of its hot burning quality.

"My method, adds he, is to make a large heap of dung and earth, that is two loads of earth to one of dung, placed in alternate layers to rot. After this has undergone a strong fermentation, I cause the whole heap to be turned and well mixed, leaving it some time longer to mellow.

"I then procure the soap ashes, and mix them with the compost, in the proportion of one load of ashes to ten of the compost, leaving, for some time, the whole to mellow together.

"When wheat seed-time comes, about the latter end of September, I cause about ten cart loads of this rich compost to be laid in little heaps on each acre of the land I intend to sow with wheat: this manure is immediately spread, and, sowing my wheat broad cast, I plough it in together with the compost.

"The advantage resulting from this practice, on stiff soils, are many; and particularly, if the farmer is the least careful in preparing his tilth, he will have a clean crop, free from smut or weeds; a matter of no small consequence to him.

"I have tried this manure on lighter lands, and find it answer extremely well, provided it has lain a considerable time in the compost heap, to mellow and abate its natural heat; but it agrees best by far with clayey soils, and in such is well worthy of being recommended as an excellent dressing for a wheat crop." *Museum Rust. vol.* IV. *pag.* 339.

Turf ASHES, the ashes procured by burning turfs, or the parings of the surface of heathy and moorish land. *See the article* BURN-BAKING.

These parings, or turfs, are cut in a dry season, and set up to dry thoroughly, leaning one against another; and, when dry, are piled into small heaps or piles, about a quarter or half a load, in each, carried up exactly square to a certain height, and then drawn up gradually in a pyramidical manner, so as to throw off any accidental showers. In a very dry season even the covering of these piles may be carried home, and stacked or housed indiscriminately with the rest; but in a wetter season it is usual to separate and dry those topmost turfs, if the weather allows, and to stack them separately, to be used on the tops of fires, when large, as dampers. A stout labourer will, in a day, cut two waggon loads of these turfs. The women and children can set them up to dry, and the women can pile them up.

These ashes (in the moors of Yorkshire, where, as the Rev. Mr. Comber informs us they are greatly used, the principal firing being turfs) are carried out daily, or once in two or three days, to the dunghill; and the farmer takes the opportunity of his first leisure towards the end of the year, to carry them out to his meadow land, on which he lays them thicker or thinner, as he has more or less land which he apprehends to want them, or more or less of them. The first rains wash them in, and the next summer never fails to shew their good effect.

It will be easily imagined, that as these ashes are much finer, or more pulverized than those of coals, so they more insinuate themselves into the soil, but are, in their effects, much less lasting. However, as every year brings a considerable supply, the farmer is less concerned that they are not a lasting manure.

In the moors of Yorkshire, the farmer is so sensible of the efficacy of these ashes, that it is become a proverb among them, "The better fire, the richer farmer." In consequence of this principle, the farmer endeavours to procure all the ashes he can from the cottagers who have no land. And hence a happy connection arises; for the poor cottager finding the article of carriage the chief part of the expence of his fuel, is wise enough to bargain with the farmer to bring him home such a quantity of his turfs in consequence of his ashes.

Some farmers lay these ashes on their ground in the spring; and, if showers follow, they will have their effect in the summer crop, though not so great as if they had been laid on at the end of the year. It must however be remarked, that he who lays on his ashes in the spring, lays on what has been very lately made in the winter; and he who lays on at the latter end of the year, lays on what has been evaporating during the whole summer; so that it is not easy to say which method is the better. *Museum Rusticum, vol.* V. *pag.* 311.

ASPARAGUS, *sparagus*, or *sperage*, corruptly called *sparrow-grass*, a plant well known in the English gardens. Mr. Miller has enumerated ten species of this plant; but that generally cultivated is the garden asparagus, called by botanists, *asparagus caule herbaceo erecto, foliis setaceis, stipulis paribus.*

The garden asparagus is propagated by sowing of the seed; in the procuring of which, you should be particularly careful to get it from some person of integrity; or, if you have any opportunity, save it yourself, or in some other neighbouring garden. In order to which a sufficient number of the fairest buds should be marked early in the spring. These buds will, many of them, produce great numbers of red berries; which should be suffered to remain upon the branches until the latter end of September, when the haulm will begin to decay; then cut off the branches, and strip the berries into

into a tub, where they may lie in an heap to ſweat for three weeks; by which means the outer huſks will be rotten: then fill the tub with water, and break all the huſks, by ſqueezing them between your hands. Theſe huſks will all ſwim upon the water, but the ſeed will ſink to the bottom; ſo that, by pouring off the water gently, the huſks will be carried along with it; and by putting freſh water two or three times, and ſtirring your ſeed about, you will make it entirely clean; then ſpread your ſeed upon a mat, and expoſe it to the ſun and air in dry weather, until it is perfectly dry; when you may put it into a bag, and hang it up in a dry place till the beginning of February; at which time, you muſt prepare a bed of good, rich earth, made very level, whereon you muſt ſow you ſeed (but not too thick, which will cauſe your plants to be ſmall) and, having trod your ſeed into the ground, rake it over ſmooth.

In the following ſummer keep it diligently cleared from weeds, which will greatly add to the ſtrength of your plants; and, towards the latter end of October, when the haulm is quite withered, you may ſpread a little rotten dung over the ſurface of the ground, about an inch thick; which will preſerve the young buds from being hurt by the froſts, &c.

The ſpring following your plants will be fit to plant out for good (for I would never chuſe plants of more than one year's growth, having very often experienced them to take much better than older, and to produce finer roots) you muſt therefore prepare your ground by trenching it well, burying therein a good quantity of rotten dung at the bottom of each trench, that it may lie at leaſt ſix inches below the ſurface of the ground: then level your whole plot very exactly, taking out all large ſtones; but this ſhould be done not long before you intend to plant your aſparagus; in which you muſt be governed according to the nature of your ſoil, or the ſeaſon; for if your ſoil is dry, and the ſeaſon forward, you may plant early in March; but, in a very wet ſoil, it is better to wait till the middle of April; which is about the ſeaſon that the plants are beginning to ſhoot. I know many people have adviſed the planting of aſparagus at Michaelmas; but this I have experienced to be very wrong; for in two different years I was obliged to tranſplant large quantities at that ſeaſon; but I had better have thrown away the plants; for, upon examination, in the ſpring, I found moſt of the roots were grown mouldy, and decaying: and, I am ſure, not one in five of them ſucceeded; and thoſe which did, were ſo weak, as not to be worth their ſtanding.

The ſeaſon being now come, you muſt, with a narrow pronged dung-fork, carefully fork up your roots, ſhaking them out of the earth, and ſeparating them from each other; obſerving to lay their heads even, for the more convenient planting them; which muſt be performed in this manner: your plot of ground being levelled, you muſt begin at one ſide thereof, ranging a line very tight croſs the piece; by which you muſt throw out a trench exactly ſtraight, and about ſix inches deep; into which you muſt lay your roots, ſpreading them with your fingers, and placing them upright againſt the back of the trench, that the buds may ſtand forward, and be about two inches below the ſurface of the ground, and at twelve inches diſtance from each other; then, with a rake, draw the earth into the trench again, laying it very level, which will preſerve the roots in their right poſition: then remove your line a foot farther back, and make another trench in like manner, laying therein your plants, as before directed, and continuing the ſame diſtance row from row; only obſerving, between every four rows, to leave the diſtance of two feet and a half, for an alley to go between the beds, to cut the aſparagus, &c.

Your plot of ground being finiſhed and levelled, you may ſow thereon a ſmall crop of onions, which will not hurt your aſparagus; and tread in your ſeeds, raking your ground level.

There are ſome perſons who plant the ſeed of aſparagus in the place where the roots are to remain; which is a good method, if it be performed with care. The way is this: after the ground has been well drenched and dunged, they lay it level, and draw a line acroſs the ground (in the ſame manner as is practiſed for planting of the young plants) then, with a dibble, make holes at a foot diſtance; into each of which you muſt drop two ſeeds, for fear one ſhould miſcarry: theſe holes ſhould not be more than half an inch deep: cover the ſeeds, by ſtriking the earth in upon it; and go on, removing the line a foot back for another row; and, after four rows are finiſhed, leave a ſpace for an alley between the beds, if it is deſigned to ſtand for the natural ſeaſon of cutting; but, if it is to be taken up for hot-beds, there may be ſix rows planted in each bed; and the diſtance in the rows need not be more than nine inches. This ſhould be performed by the middle of February, becauſe the ſeeds lie long in the ground: but, if onions are intended to be ſown upon the ground, that may be performed a fortnight or three weeks after, provided the ground is not ſtirred ſo deep as to diſturb the aſparagus-ſeeds, in raking the onion ſeed into the ground.

As the roots of aſparagus always ſend forth many long fibres, which run deep into the ground; ſo, when the ſeeds are ſown where they are to remain, theſe roots will not be broken or injured, as thoſe muſt be which are tranſplanted; therefore they will ſhoot deeper into the ground, and make much greater progreſs; and the fibres will puſh out on every ſide; which will cauſe the crown of the root to be in the center; whereas, in tranſplanting, the roots are made flat againſt the ſide of the trench.

When your aſparagus is come up, and the onions have raiſed their ſeed-leaves upright, (which will be in three weeks or a month after planting) you muſt, with a ſmall hoe, cut up all the weeds, and thin your crop of onions, where they may have come up in bunches; but this muſt be done carefully, and in dry weather, that the weeds may die as faſt as they are cut up, being careful not to injure the young ſhoots of aſparagus. This work muſt be repeated about three times; which, if well done, and the ſeaſon not too wet, will keep the ground clear from weeds, until the onions are fit to be pulled up, which is commonly in Auguſt; and is known, when their greens fall down, and begin to wither. When you have drawn off your onions, you muſt clean your ground well from weeds; which will keep it clean till you earth your beds, which muſt be done in October, when the haulm begins to decay; for if you cut off the haulm, while green, the roots will ſhoot freſh again, which will greatly weaken them. This young haulm ſhould be cut off with a knife, leaving the ſtems two or three inches above ground; which will be a guide to you to diſtinguiſh the beds from the alleys; then, with an hoe, clear off the weeds into the alleys, and dig up the alleys, burying the weeds in the bottom; and throw the earth upon the beds, ſo that the beds may be about five inches above the level of the alleys: then you may plant a row of coleworts in the middle of the alleys; but do not ſow or plant any thing upon the beds, which would greatly weaken the roots: nor would I ever adviſe the planting of beans in the alleys (as is the practice of many) for it greatly damages the two outſide rows of the aſparagus. In this manner it muſt remain till ſpring, when you muſt hoe over the beds, to deſtroy all young weeds; then rake them ſmooth, and obſerve, all the ſucceeding ſummer, to keep them clear from weeds; and in October dig up the alleys again, as was before directed, earthing the beds, &c.

The ſecond ſpring after planting, you may begin to cut ſome of your aſparagus, though it will be much better to ſtay until the third; therefore now you muſt fork up your beds with a flat pronged fork, made on purpoſe, which is commonly called an aſparagus fork: this muſt be done before the buds ſhoot in the ſpring, and with care, leſt you fork too deep, and bruiſe the head of the root; then rake the beds over ſmooth, juſt before the buds appear above ground; which will deſtroy all young weeds, and keep your beds clean much longer, than if left unraked, or done ſo ſoon as forked: and, when your buds appear about four or five inches above-ground, you may then cut them; but it ſhould be done ſparingly, only taking the large buds, and ſuffering the ſmall to run up to ſtrengthen the roots; for, the more you cut, the greater will be the increaſe of buds; but they will be ſmaller, and the roots ſooner decay. When you cut a bud, you muſt open the ground with your knife (which ſhould be very narrow and long in the blade, and filled with teeth like a ſaw) to ſee whether

whether any more young buds are coming up close by it, which might be either broken or bruised in cutting the other; then, with your knife, saw it off about three inches under-ground: This may appear a troublesome affair, to people unacquainted with the practical part; but those who are employed in cutting asparagus, will perform a great deal of this work in a short time; but care in doing it is absolutely necessary to be observed by all who cut asparagus.

The manner of dressing your asparagus-beds is every year the same as directed for the second; viz. keeping them from weeds, digging the alleys in October, and forking the beds towards the end of March, &c. only observe, every other year, to lay a little rotten dung (from a melon or cucumber-bed) all over your beds, burying some in your alleys also, at the time for digging them up. This will preserve the ground in heart to maintain your roots in vigour; and by this management, a plat of good asparagus may be continued for ten or twelve years in cutting, and will produce good buds, especially if it be not cut too long each season; for when it is not left to run up pretty early in June, the roots will be greatly weakened, so that the buds will be smaller: therefore in those families where asparagus is required late in the season, a few beds should be set apart for that purpose, which will be much better than to injure the whole plantation, by cutting it too long.

The quantity of ground necessary to be planted with asparagus, to supply a small family, should be at least five or six rods; less than that will not do: for if you cannot cut one hundred at a time, it will scarcely be worth while; for you must be obliged to keep it after it is cut two or three days, to furnish enough for one mess; but for a larger family, twelve rods of ground should be planted, which, if a good crop, will furnish two or three hundred each day in the height of the season. *Miller's Gard. Dict.*

Asparagus-*fork*, a flat pronged fork, made on purpose to fork up the beds of asparagus.

ASPECT, among gardeners, the same with exposure. *See the articles* Exposure.

ASPEN-TREE, a species of the poplar, and called by botanists, *populus foliis subrotundis dentato angulatis utrinque glabris.* Poplar-tree with roundish leaves, having an angular indenture, and smooth on both sides.

The leaves of this tree stand upon long slender foot-stalks, so as to be shaken by the least wind, from whence it has been called the trembling poplar, or aspen-tree.

The method of cultivating this tree is the same in every respect as that of the abele-tree. *See* Abele-Tree.

ASS, a creature well known in most parts of Europe, and proves very useful in many respects, if taken proper care of.

The horse is trained up, great care is taken of him, he is instructed and exercised; while the poor ass is left to the brutality of the meanest servants, and the wantonness of children, that so far from improving, he must be a loser by his education: and indeed had he not a large fund of good qualities, the manner in which he is treated is sufficient to exhaust them. He is the sport, the but, and the drudge of the vulgar; who, without the least thought or concern, drive him along with a cudgel, beating, overloading, and tiring him. We do not remember, that, if there were no horses, the ass would be considered, both with regard to himself and us, as the most useful, most beautiful, and most distinguished of animals. Instead of being the first, he is now the second; and from this accident alone he is held in no estimation. It is the comparison that degrades him: he is considered, not in himself, but relatively to the horse. We forget that he is an ass; that he has all the qualities of his nature, all the gifts annexed to his species; and think only on the figure and qualities of the horse which are wanting in him, and which it would be improper for him to have.

By his natural temper he is as humble, as patient, and as quiet, as the horse is proud, fiery, and impetuous; he bears with firmness, and perhaps with courage, blows and chastisements. He is sober, both with regard to the quantity and quality of his food, contenting himself with the most harsh and disagreeable herbs, which the horse, and other animals, will not touch. In water he is very nice, drinking only of that which is perfectly clear, and at brooks with which he is acquainted. *Buffon's Histoire Naturelle, tom.* IV.

The ass, though a contemptible creature, is very serviceable to many that are not able to buy or keep horses; especially where they live near heaths or commons, the barreness of which will keep them, being contented with any trash, dry leaves, stalks, thistles, briars, chaff, and any sort of straw is excellent food for them; they require very little looking after, and will sustain labour, hunger, and thirst, beyond most creatures. They are seldom or never sick; and endure longer than any other creature. They may be made use of to plough light lands, to carry burdens, to draw in mills, for which they are very excellent, to fetch water, or any other odd things. They are very useful for their milk, which is an excellent restorative in consumptions, and other weaknesses: but they would be of much more advantage were they used, as they are in foreign countries, for the breeding of mules. *See the article* Mule.

The she-ass, if you have any regard to their breed, should be covered between the months of March and June. The best age to breed from is from three years old to ten, and you should let the young ass suck two years, and not work them till they are three years old.

Those are reckoned the best shaped that are well squared, have large eyes, wide nostrils, long necks, broad breasts, high shoulders, a great back, short tail, the hair sleek and of a blackish colour: their skins make the most durable shoes of any sort of leather. *Mortimer's Husbandry, vol.* I. *pag.* 222.

ATMOSPHERE, the vast body, or collection of air which surrounds the earth to a very considerable height.

Clouds, which are precipitated in drops of rain for the service of mankind, do not consist wholly of watery particles; for besides aqueous vapours, and what these contain, there are raised from the surface of the earth into the air, sulphureous and saline particles, which are also carried up into the clouds, and mixed with the aqueous vapours. Here we have a mixture of all such substances, as it were, in their extremely small parts, floating in the air together, and the effects of these sulphureous and saline particles, thus mingled with aqueous vapours, are sometimes very sensible, especially in thunder and lightning; when the sulphureous and nitrous particles taking fire, by the motion arising from heat, break out with the violence of flashes and noise, very much resembling the effects of gunpowder.

Another proof that there are nitrous particles raised into the air, we have in the nourishment which rain, replete with these ingredients, gives to plants, more than any other water; and also from the collection of nitre, or saltpetre, in heaps of earth, out of which these principles derived from rain are known to be extracted, if these heaps of earth be exposed to the air, so as to keep the wet weather from spoiling the operation. It is also a convincing argument, that these nutritive ingredients are of consequence in vegetation, by plants in water refusing to grow in droughty weather, notwithstanding they have such plenty of moisture; from their being absolutely at a stand when rain has been long a stranger to the earth, they are plainly seen to go forward with the business of vegetation, like those plants which have been deprived of motion or growth, when the fine showers descend, and continue to do so for some time.

Here then, in both cases of the plants in a pond, there is water, but there are only in one these vegetative principles, which give motion to the plants, and consequently those ingredients are absolutely necessary to vegetation; and therefore we may conclude, that water, when properly dilated by fermentation at the roots, is only an assistant to plants, in applying those necessary principles, or helping to conduct them through the tubular interstices of the fibres, or to float the nitrous particles through the whole system of the operation in motion, or growth of vegetables, and not the food itself, or any sort of nourishment when divested of those principles. Whether, therefore, the system of exceeding fine fibres, or or tubes of a plant at a ftand in a pond, in a very droughty feafon, admits that water undilated, for want of nutritive, or fermenting principles, into its body, during the great want of rain; or whether it abfolutely refufes to imbibe, or cannot attract, for want of a finer divifion of its parts, any of it, as there are in it no nutritive ingredients, does not feem to admit of any doubt in favour of the latter queftion, which, if true in nature, may poffibly be of fervice in the growth of fome forts of plants, and perhaps fave much trouble in attempting to force others forwards with fome fort of water.

Since it is plain, that there is a vaft quantity of nitrous, fulphureous, and bituminous matter all over the furface of the earth, and that plants and animals abound with volatile falts, we need not wonder that the heat of the fun fills the air with fuch fine particles, and all forts of unctuous exhalations, by firft expanding them, after which they rife till they meet with air and other mixtures of the fame fpecific gravity. What are ufually called *ignes fatui*, feem to confift of a more unctuous fubftance than other exhalations, for we find their oily particles are eafily fixed, but not fo foon fpent as thofe of fulphur and nitre. Shooting ftars are improperly fo called, becaufe they are nothing more than exhalations kindled in the air; and if a long train of fubftances take fire at once, it is commonly termed a *dart*; and if there be many, and they continue in the fame place, they are then called *beams*.

Thus we plainly fee how full the atmofphere is of thefe rich ingredients for the bufinefs of vegetation; and becaufe they are of fuch vaft confequence to the growth of plants, we will enumerate the fources of them upon the frame of the globe; from whence the fun and wind borrow them, in order to difperfe them properly in the air, that they may intimately mix, and defcend with the rain drops, and fo be conveyed to the mouths of the fibrous tubes of plants with the greateft care and fkill; from thefe ingredients firft leaving the furface of the earth, through the whole procefs of their various motions, configurations, and combinations, till they are prepared in the moft exquifite manner to be received into the bowels of vegetables, which we plainly fee ftand in great need of them, as without their friendly affiftance, or fome compofitions of dung to refemble them, they are unable from water and earth alone to get forward to maturity.

Salts are of various kinds, but all have a fharp pungent tafte, though not all alike; and of thefe fome are dug out of the earth like ftone out of a quarry; others are made by art, by letting the fea-water into fhallow pits on the fhore, and continue there till the aqueous particles are exhaled by the fun and wind, and then the falt remains at the bottom. The falt is in its nature the fame in both cafes; for the faline particles are not made by art in the combination of ingredients to imitate it; they are only feparated from the watery particles wherein they floated. The qualities of this excellent ingredient in vegetation are, that it eafily diffolves, and melts readily in the open air, if it be refined from all heterogeneous matter; when the water wherewith it is entangled is any ways drawn off, there remains a grofs fediment, but the finer parts are carried away with it; this fediment is the only part the fire cannot melt, but reduces it to a calx.

This facility of the finer parts fwimming, as they are fpecifically lighter than water, contributes to the benefit of plants; or rather thefe fine faline particles are of the fame fpecific gravity with the water; that they may intimately mix with it, and be carried in thofe vapours through all the neceffary ftages, till they return to the earth again. This quality of melting and diffolving in water and air, fets the finer parts at liberty, and prepares them to take wing with the common exhalations. And yet the fediment, or groffer parts, which are left behind, have their excellent ufes in helping the embrios of plants to fend out their fibrous tubes, in fearch after more refined particles, which either adhere to the fuperficies of the particles of earth, or are contained in their internal pores.

Nitre, of which there are feveral forts, natural and artificial, the former refining itfelf, and the latter refined by art, is a kind of falt, which eafily takes fire, but like fea-falt is eafily reducible to a calx. The vapours, or particles of nitre, when they defcend for the ufe of plants, are found to contain abundance of fpirits; for the nitre, as a falt, is impregnated with them, which render it volatile, and the fluid extracted from it is very fharp and corrofive. The calx to which nitre is reducible, as well as the calx of common falt, has its excellent ufe in vegetation; and when it is reduced by fire to this ftate, it then takes the name of fixed falt, or rather the afhes of falts: the benefit of this calcination to land is manifeft from the afhes of burnt vegetables, and other natural bodies reducible to a calx: for the rich principles, or food, if we may call it fo, of vegetables, are contained more or lefs in all bodies, whofe parts can be thus feparated, as is evident from the operations in chemiftry, which reduce bodies to their component parts, by the help of fire.

Sulphur is a liquid clammy fubftance, whofe parts are foon feparated, and rife up into the air with other vapours, and foon occafions violent motions in the atmofphere, and becomes entombed in the aqueous particles, and is with the rain brought down to the plants. Bitumen is pretty much of the fame nature with fulphur, and with it is found in great plenty in moft bodies, but in the moft remarkable manner, and in the greateft quantities, in pit-coal; yet not in equal quantities, as fome coals burn better than others, and confequently may contain more or lefs of thefe principles, which are apt to burn. Naptha is a kind of bitumen, and the only difference is, that it takes fire fooner than bitumen is obferved to do, and is not fo eafily quenched; and this facility of admitting the heating particles, which throw thefe inflammatory bodies into a fpeedy motion internally, is of great ufe in the different degrees of the plant's growth.

Maltha feems to be a fpecies of naptha; its properties, as they appear to common obfervation, are, that if it touches any thing, it fticks fo faft to it, as not eafily to be feparated; and water thrown on it in moderate quantities, does but the more inflame it, and earth alone is able to quench it. This valuable ingredient, when it defcends in the drops of rain, adheres very intimately to the internal parts of the foil, both in the fuperficies and the concave parts of the pores; and other defcents of rain increafe the motion of the internal parts of the particles of maltha, and thereby promote a fine dilatation in the tubular interftices of the fibres of plants, and duly contribute to the acceleration of that motion in them, which is neceffary to the different ftages of their growth and nourifhment. Before the fine parts of the maltha are in readinefs, or duly prepared by moifture, and their well regulated fermentation, and while it is waiting for the defcent of more rain, it is divefted of all internal motion, and confined as a prifoner, till the other requifites to the plant's welfare are properly affembled, and ready to perform their offices.

Thefe are the chief materials which give motion to plants, and of which the latter are found to confift, when they are analized, unfolded, or feparated into their component parts by chemiftry. The profeffors of that art call the volatile fpirits, fulphur, and faline particles, the active principles; becaufe thefe, when duly prepared, and exactly applied to the mouths of the fibres, become the fole agents, and by their continual motion, caufe the whole action of the plant.

The vapours thus raifed from the furface of the earth, become the original matter of all meteors, or heterogeneous fubftances, fit for the production of the vegetable world; and confequently an inftrument in the wife appointment of Divine Providence, for the prefervation of man, and all fubordinate animals. When thefe heterogeneous vapours are thus lifted up above the earth, one degree of cold condenfes them into larger globules, which then becoming fpecifically heavier than the atmofphere, fall in drops of rain, and bring down all thofe treafures entombed in them. A greater degree of cold produces a coagulation of the heterogeneous vapours, which fhoot like

like falts into various forms, united into certain angles, and make the flakes of fnow, which ftill contain the nutritive principles.

A third, or ftill greater degree of cold, combines the vapours into a harder fubftance, wherein the valuable ingredients are intombed, and they defcend in what we call hail; but if the cold condenfes the vapours before they rife high above the furface of the earth, they will be unable to afcend, but will hover about, and fill the lower part of the atmofphere with what is ufually called a fog, or mift; and if the cold be ftill more intenfe, the mift is frozen to every twig and blade of grafs in form of a white incruftation, which is called rime. When the air in the day-time is warm, and the vapours buoyed up in it are too fine to be then vifible, they will be condenfed by the coolnefs of the evening, and defcend on the vegetables in the form of dew: and if the evening of fuch a fine day be cold enough to freeze, then inftead of a dew, the furface of the ground will be covered with what is commonly called a white froft. Thefe are the various ways appointed to bring down again upon the earth the treafures that were taken from it, in order to be prepared and properly fpread over the globe, by methods and contrivances equally beautiful and furprizing; and all this for the fupply of needy man, who is, when thefe bleffings are for a confiderable time withheld from him, turned to deftruction.

But amongft the riches of the atmofphere for the production of vegetables, we muft not forget the confequences which the air itfelf is of to them, as we have already obferved under the article air. *See* AIR. *Randall's Semi-Virgilian Hufbandry.*

AVENUE, a walk planted on each fide with trees, leading to an houfe, wood, &c.

The Englifh elm will do in all grounds, except fuch as are very wet and fhallow; and this is preferred to all other trees, becaufe it will bear cutting, heading, or lopping in any manner, better than moft others. The rough or fmooth Dutch elm is approved by fome, becaufe of its quick growth; this is a tree that will bear removing very well; it is alfo green almoft as foon as any plant whatever in fpring, and continues fo as long any, and it makes an incomparable hedge, and is preferable to all other trees for lofty efpaliers. The lime is valued for its regular growth, and fine fhade: the horfe chefnut is proper for all places that are not too much expofed to rough winds. The common chefnut will do very well in a good foil, and rifes to a confiderable height, when planted fomewhat clofe, though, when it ftands fingle, it is rather inclined to fpread than grow tall. The beech is a beautiful tree, and naturally grows well with us in its wild ftate, but it is lefs to be chofen for avenues than the before-mentioned, becaufe it does not bear tranfplanting well, but is very fubject to mifcarry. Laftly, the abele is fit for any foil, and is the quickeft grower of any foreft-tree. It feldom fails in tranfplanting, and fucceeds very well in wet foils, in which the others are apt to fail. The oak is but little ufed for avenues, becaufe of its flow growth.

The old method of planting avenues was with regular rows of trees, and this has been always kept till of late; but we have now a much more magnificent way of planting avenues: this is by fetting the trees in clumps or platoons, making the opening much wider than before, and placing the clumps of trees about three hundred feet diftant from an one other. In each of thefe clumps there fhould be planted either feven or nine trees; but it is to be obferved, that this is only to be practifed where the avenue is to be of fome confiderable length, for, in fhort walks, this will not appear fo fightly as fingle rows of trees. The avenues made by clumps are fitteft of all for parks. The trees in each clump fhould be planted thirty feet afunder, and a trench fhould be thrown up round the whole clump, to prevent the deer from coming to the trees to bark them. *Miller's Gard. Dict.*

AVER, a general name for a labouring beaft of any kind.

AVERAGE, a term ufed by the farmers of many parts of England for the breaking up of corn fields; otherwifed called eddifh, or roughings.

AVER-CORN, a name formerly given to the corn conveyed to the lord's granaries by his tenants.

AVER-LAND, the land ploughed by the tenants for the ufe of their lord.

AUGUST, the eighth month of the civil year.

This month returns the countryman's expences into his pockets, and encourages him to another year's adventure. If it proves dry, warm, and free from high winds, it faves a great deal of the hufbandman's expence.

You may yet twifallow, alfo lay on your compoft or foil, as well on your lands intended either for barley or wheat.

Carry wood, or other fuel home, before winter approaches, and renders the roads deep and heavy.

Provide good feed, and well picked, againft feed-time.

Put your ewes and cows you do not like to fatten.

This is generally the principal harveft-month for all forts of grain, therefore make the beft ufe of good weather while you have it.

About the end of this month you may mow your after-grafs, and alfo clover, faintfoin, and other French grafs. Geld lambs, and make the fecond return of your fat fheep and cattle. *Mortimer's Hufbandry, vol.* II.

AUGRE, an inftrument much ufed by carpenters, wheelrights, &c. for boring large round holes. It confifts of a wooden handle and an iron blade, terminated with a fteel bit.

A common augre may be very ufefully applied to try the nature of the under foil, and layers of earth, in order to know what may be expected from them, with regard to the vegetation of plants. In order to this three augres will be neceffary; the firft of them about three feet long; the fecond fix; and the third ten. Their diameters fhould be near an inch, and their bits large, and capable of bringing up part of the foil they pierce. An iron handle fhould be fixed crofs-ways to wring it into the earth; from whence the inftrument muft be drawn up, as often as it has pierced a new depth of about fix inches, in order to cleanfe the bit, and examine the foil. But the borer, an inftrument invented by the marquis de Tourbilli, is much better adapted to this operation. *See the article* BORER.

AVIARY, a place fet apart for the feeding and propagating birds. An aviary fhould be fufficiently large as to allow the birds a confiderable freedom of flight; and turfed, to avoid the appearance of foulnefs on the floor.

AUMBRY, *Ambry*, or *Aumery*, a pantry, or cupboard to fet victuals in.

AURICULA, the name of a plant, which has of late years been cultivated with extraordinary care and pains by the curious in gardening, being highly efteemed for its producing a very beautiful flower, which is diverfified of a greater variety of colours, and exhibits more properties to complete the idea of the fancy of a florift, than any other fpecies of the flowery tribe.

The characters of a good auricula are the following: 1. The ftem of the flower fhould be lofty and ftrong. 2. The foot-ftalk of the fingle flower fhould be fhort, that the umbel may be regular and clofe. 3. The pipe, or neck of each flower fhould be fhort, and the flowers large, and regularly fpread, being no ways inclinable to cup. 4. The colours fhould be very bright, and well mixed. 5. The eye of the flower fhould be large, round, and of a good white or yellow; and the tube, or neck, not too wide.

In order to obtain good auriculas from feeds, you muft make choice of the beft flowers you have; which fhould be expofed to the open air, that they may have the benefit of fhowers, without which they feldom produce good feeds. The time of their ripening is in June or July, which you may eafily know by the feed-veffel turning to a brown colour, and opening; you muft therefore be careful left the feeds be fcattered out of the veffel, for it will not be all fit to gather at the fame time.

The general time for fowing this feed is in Auguft, but if it be fown before Chriftmas it will be time enough.

The beft foil for this feed is good frefh fandy mould, mixed with very rotten neats dung, or very rotten dung from

from the bottom of an old hot-bed: with this you ſhould fill your pots or boxes in which you intend to ſow your ſeeds; and having levelled the ſurface of the earth very ſmooth, ſow your ſeeds thereon, covering it very lightly with rotten willow mould, taken out of the ſtems of decayed hollow willow-trees; then cover the box, &c. with a net or wire, to prevent the cats, fowls, &c. from ſcratching out, or burying your ſeeds too deep. Let theſe boxes, &c. be placed ſo as to receive only the morning ſun, during the winter ſeaſon; but in the beginning of March remove them where they may have ſcarce any ſun, for your plants will now ſoon begin to appear; and if expoſed to one whole day's ſun, would be all deſtroyed.

During the ſummer ſeaſon, refreſh them often with water in dry weather, but never give them too great great quantities at once. In the month of July following, your young auriculas will be large enough to tranſplant, at which time you muſt prepare a bed or boxes, filled with the above-mentioned ſoil, in which you may plant them at about three inches diſtant; and, if in beds, you muſt ſhade them every day, till they are thoroughly rooted, as alſo in very hot dry weather; but if they are in baſkets or boxes, they may be removed into a ſhady place.

When the ſeedling auriculas are planted in beds, there ſhould be ſome rotten neat's dung laid about ten inches under the ſurface, and beaten down cloſe and ſmooth: this will prevent the worms from drawing the young plants out of the earth, which they generally do where this is not practiſed. This dung ſhould be laid about a foot thick, which will entirely prevent the worms getting through it, until the plants are well eſtabliſhed in the beds; and the roots of the auriculas will ſtrike down into the dung by the ſpring, which will make their flowers ſtronger than uſual: theſe beds ſhould be expoſed to the eaſt, and ſcreened from the ſouth ſun.

The ſpring following many of theſe flowers will ſhew; when you may ſelect ſuch of them as have good properties, which ſhould each of them be removed into a ſeparate pot of the ſame prepared earth, and preſerved until the next ſeaſon, at which time you will be able to form a judgment of the goodneſs of the flower; but thoſe that produce plain coloured, or ſmall flowers, ſhould be taken out and planted in borders, in the outparts of the garden; and the others which do not produce their flowers the ſame year, may be taken up, and tranſplanted into a freſh bed, to remain till you ſee how they will prove.

The manner of propagating theſe flowers when obtained, is from off-ſets, or ſlips, taken from the old roots in April, when the flowers are in bloom: theſe off-ſets muſt be planted into ſmall pots filled with the ſame ſort of earth, as was before directed for the ſeedlings; and during the ſummer ſeaſon ſhould be ſet in a ſhady place, and muſt be often, but very gently, refreſhed with water. In the autumn and winter they muſt be ſheltered from violent rains. The ſpring following theſe young plants will produce flowers, though weak; ſoon after they are paſt flowering, you muſt put them into large pots, and the ſecond year they will blow in perfection. *Miller's Gard. Dict.*

AWMS, the beard of wheat or barley. The word is, in ſome parts of England, pronounced *ails*.

AXIS, or *axle-tree*, of a waggon, cart, &c. is the ſtrong piece of wood or iron, which ſupports the carriage, and round the extremities of which the wheels turn. *See the articles* CART *and* WAGGON.

B.

BACK-SINEW, in a horſe, is that ſtrong ſinew extending along the hinder part of the ſhank from the knee to the heel, into which it is inſerted.

The back-ſinew is ſo very ſubject to be hurt or ſtrained, that it is conſidered as one of the moſt common and uſual accidents that happens to a horſe; it generally proceeds from hard riding upon dry grounds, and from other cauſes, where the roads are ſtony and hard, and ſometimes where they are poachy.

It is eaſily perceived by the ſwelling of the ſinew, which ſometimes extends from the knee down to the heel; and when it is ſo, a horſe does not care to ſet his foot even upon the ground; but, for the moſt part, in his ſtanding, ſets it before the other.

The uſual way of curing this malady, is with cold charges, which often ſucceed very well, if often renewed; ſome uſe curriers ſhavings bound round the knee with a bandage, and this alſo anſwers very well in ſome caſes; but there is nothing either ſo ready or efficacious as vinegar or verjuice mixed with bole, being often in a day ſoaked well into the ſinew warm; and if any thing of the lameneſs or ſwelling remains after this, and after the heat and inflammation is gone off, a mild bliſter, that has nothing corroſive in it beſides the cauſtic ſalt of the flies, will, generally ſpeaking, effectuate a cure, and bring the ſinew fine.

When hot and relaxing oils mixed together are uſed to the back-ſinew, which many practitioners are fond of, becauſe they ſometimes ſucceed in horſes that have their ſinews ſtrong and rigid, yet they are apt to engender wind-galls of a bad kind, or make the veins on each ſide the ſinew to be full and gorged; and horſes have been known to be lame for two or three years together with theſe varixes in the veins. Bliſtering in this caſe has very little or no effect, firing through the vein till the blood comes being only ſufficient to remove that weakneſs. After the firing, the whole leg from the knee down to the heel, and all the hollow places on both ſides, muſt be charged with a good ſtrengthening plaiſter, which will perfect the cure, eſpecially if the horſe be turned to graſs for a month or five weeks, or, in the winter, if he run a little while in a ſmooth yard, where he has good dry litter. *Gibſon on the Diſeaſes of Horſes.*

BACON, the fleſh of a hog dried in the ſmoke.

A writer in the *Muſeum Ruſticum*, vol. III. pag. 234, has given us the following method of making bacon in Somerſetſhire.

The ſeaſon for killing hogs for bacon is between September and Chriſtmas. When you kill a large hog for bacon, lay the ſides in the ſalting-troughs, and ſprinkle them pretty heavily with bay-ſalt: then leave them twenty-

twenty-four hours to drain away the blood, and fome of the over abounding juices.

After this take them out, wipe them very dry, and throw away the drainings. Then take fome frefh bay-falt, and heating it well in a large iron frying-pan, rub the meat very well with it; repeating this work every day for four days, and turning the fides every other day.

If the hog be large, keep the fides in brine (turning them ten times) for three weeks; after which take them out, and let them be thoroughly well dried in the ufual manner: if they are not fully dried, they will neither keep fo well, nor eat fo fine.

BADGER, the name of an animal, common in many parts of England; and called by feveral names, as a gray, a brock, a borefon, or a baufon.

Badgers are almoft as pernicious a creature to the hufbandman as the fox, though not fo fubtile, nor can they fo eafily catch their prey; but for what they can catch, as new fallen lambs, young pigs and poultry, they are as bad. The way to catch them is with a fpringe, or a fteel trap, or to dig a pit acrofs their path five feet deep, and about four feet long, making it narrow at the top and bottom, and wide in the middle. This muft be covered with fome fmall fticks and leaves, fo as that the badger may fall in when he comes upon it. Some hunt them into their holes in a moon-fhine night, and then dig them out. *Mortimer's Hufbandry, vol.* I. *pag.* 314.

BAG, a name given by farriers to a medicine for recovering a horfe's appetite when loft. It is done in this manner: they take an ounce of affa fœtida, and an equal quantity of the powder of favin; thefe ingredients they put into a bag, which they faften to the horfe's bit, keeping him bridled for two hours, two or three times a day: as foon as the bag is taken off, he will immediately eat. The fame bag will ferve a long time.

BAKING *of land.* If fome forts of ftiff and binding land be fown dry, and a fcudd of rain falls before the earth has time to fettle, it is obferved that the cruft of fuch land will bake, fo that the corn cannot come through, to the great damage of the crop; this evil does not happen if fuch a fcudd of rain be followed by cool cloudy weather, and not hot fun-fhine; for then the earth will not lie fo hollow as to be baked. The beft way to prevent this is, to roll it immediately after fowing, which faftens the earth together, whereby the fun has not that power of piercing into it, and confequently not of baking it.

Land of this kind fhould, therefore, be fown as often as poffible with winter corn, fuch as wheat and vetches; for though, if wet follows the fowing, the fun is not ftrong enough at that time of the year to fcorch the ground up, and bind it; and it is obferved, that this fort of ground has been always lucky for vetches, probably for the above reafon. *Lifle's Obfervations in Hufbandry, vol.* I. *pag.* 26.

BALK, a piece of land which has been either cafually overflipped, or not turned up in ploughing; or carefully left untouched by the plough, for a boundary between lands, or fome other ufe.

BALK, alfo fignifies the fummer-beam, or dorman of a houfe.

BALKS, or *bawks*, implies poles laid over a ftable, or other building, for a roof.

BALM. *See the article* BAUM.

BANDS, a fmall parcel of the longeft wheat taken from the grips, and twifted together at the ear ends, for binding the wheat into fheaves.

The bands fhould be laid in the morning, that they may not crack; for the ftraw will not twift after the fun is up, but will be brittle, and break off below the ears. The turning of three or four of the ftubble or bottom ends of the ftraw to the ears of the band, helps greatly to add to its ftrength and toughnefs.

The bands for binding up the fheaves fhould not be fpread but in fair weather, becaufe being preffed down by the grip or two which it is neceffary to lay upon them to keep them in their places, and prevent their being untwifted by the fun, they will grow fooner than any other part of the corn, if rain fhould come; for they cannot dry on account of their lying undermoft. But though the bands muft always be made while the morning dew is upon them, the fheaves ought by no means to be bound up wet: if they are, they will certainly grow mouldy.

Farmers do not always attend fufficiently to the binding up of their fheaves, but fuffer the reapers, for difpatch, to tie the bands juft underneath their ears, inftead of binding them at the other end; the confequence of which is, that they will hardly hold together to be flung into the cart, and will certainly be in great danger of falling to pieces before they are thrafhed.

If a little rain be forefeen in harveft time, it is beft to bind the grips into fheaves as faft as they are made; becaufe fmall fhowers will wet the fingle grips fo much, that they cannot be bound up, and thefe fhowers may be the fore-runners of greater rains. The fheaves being bound will foon dry after fuch wet. But if a hard rain is forefeen, the beft method is not to bind the wheat into fheaves, becaufe they will then be wet to the bands, and muft be opened again. Mr. Lifle tells us, that one of his neighbours to whom this happened, unfheafed fome of his wheat to dry it, and opened it and turned it fo often, that the ears broke off, whereby he loft half his corn; caution therefore ought to be ufed in this cafe, left by curing one evil we create a worfe. *Lifle's Obfervations in Hufbandry, vol.* I. *pag.* 333.

BANDS *of a faddle* are two pieces of iron, flat, and three fingers broad, nailed upon the bows of a faddle, one on each fide, contrived to hold the bows in the fituation that makes the form of a faddle.

BANE, in fheep, the fame with rot. *See the article* ROT.

BANGLE-EARS, an imperfection in a horfe, which may be remedied in the following manner: place his ears as you would have them ftand, and then with two little boards, or pieces of trenchers, three fingers broad, having two long ftrings faftened to them, bind the ears fo faft in the places where they ftand, that they cannot ftir; then behind the head, and the root of the ears, you will fee a great deal of empty, wrinkled fkin, which you muft pull up with your finger and thumb, and clip away with a pair of fharp sciffars all the empty fkin clofe by the head; then with a needle and red filk, ftitch the two oufides of the fkin together, and heal the wound with a mixture of honey and turpentine: when this is done, take away the fplints that hold up the ears, and in a little time they will keep the place where you fixed them without alteration.

BANK, a heap of earth piled up to keep out the water of a river, lake, or the fea.

Sloping banks are the beft fecurity againft the incroachments of the fea, of rivers, or of lakes; making proper allowance for the weight of water, and violence of the waves. Thefe banks fhould be raifed about two feet above the level of the water at the higheft tides, and their ftrength fhould be proportioned to the force of the water intended to be fenced off. When a river is too much confined, it fwells confiderably upon a flood, and confequently requires banks of greater height and ftrength than would otherwife be neceffary; though it will fometimes break even thefe, and carry all before it, if a fufficient fpace be not allowed for the increafe of its water: but when fuch a fpace is left, the waters fpread, and feldom rife more than two or three feet above their ufual level. In fome cafes a breadth of fifteen or eighteen feet, on each fide may do; but in others, fifty, eighty, or an hundred feet, or perhaps fo many yards, according to the largenefs of the river, muft be left open for that purpofe. It is beft to err on the fafe fide; efpecially as the ground that is left between the banks and the river will be far from being loft; for it will afford good grazing in the dry feafons of the year, and may be planted with ofiers, and willows, and other trees of that kind; but thefe fhould never be planted upon the banks, left the winds fpoil and tear them, by fhaking the trees, and loofening their roots.

In the ifle of Ely, it is common to fee great banks diftant one or two hundred yards on each fide from the channel of the river; and when they are fo made, they are always fafe: but where the diftance between the banks is narrow, there, and there only, the banks are in in danger of being broken down, and the country of being overflowed.

If a confiderable body of water is to be guarded againft, dig a trench ten or twelve feet wide, and two or three deep, or more, according to the height of the bank required. Lay all the foil that is taken out of this trench, on that fide of it which lies towards the water, and leave a fpace of two or three feet between the trench, and the foot of the bank. Let the bank be made with an eafy flope of fifteen or eighteen feet in length towards the water, allowing the flope two and a half, or three feet fall to one in height; but the infide flope need not be more than eight or nine feet, which is a foot and a half flope to one foot perpendicular. The bank thus raifed five or fix feet high, according as the floods require, will be two feet wide at the top, where it fhould be well flatted, that people may walk upon it. Let it then be covered with gravel dug out of the channel of the water, by which means the river will be deepened, and the bank rendered ftronger; and to add to the latter, fow it very thick with grafs-feed. This will be found much better than turfing it with fods taken from off the trench, or fome neighbouring ground; becaufe the fods are apt to fhrink, open, and part from one another in dry weather, and are then liable to be wafhed away with the next flood; whereas in this much cheaper way, a clofe covering of grafs, even long enough to mow, will be formed in a month or two: far fitter than fods to break the furface of the bank; for any tolerable foil may be very foon brought to have a coat of grafs, by only raking it fine, and fowing it with grafs-feeds. In a week or ten days in the fpring, or fummer, the grafs will be up, and grow to fuch a height in a month or fix weeks, as to be fit for mowing.

Some have attempted to guard againft inundations by building walls of ftone and lime, where the materials are in plenty. The great danger here is their being undermined, and that chiefly by the water's ftriking with force againft the bottom, upon meeting with refiftance from the wall. But this may be eafily guarded againft by laying a row of flat ftones lower than the bottom of the river; for the water ftriking againft thefe ftones, turns off without any danger to the foundation.

The broad trench within the bank, befides affording materials for making the bank and flopes, is attended with the farther advantage of ferving for a drain to the inland ground. Thefe trenches fhould always be carried as far as the banks, particularly when thefe are intended to fence off a rifing tide; and in the loweft part of the ground a fluice with a valve, flap-door, or flood-gate fhould be placed in the bank, where it will both difcharge the inland water, when the tide is out, and prevent its flowing in. The feafon of the year freeft from floods fhould be chofen for making thefe banks, that the bank may have time to fettle and grow firm before the heavy rains come on. It is alfo advifable to be as expeditious as poffible in this work. For if it be begun in a dry fummer, and finifhed in a month or two, there will be little danger of being interrupted by extraordinary floods or violent ftorms, either of which might do more harm in one day, than could be repaired in a fortnight.

The exact dimenfions of the bank, and of the ditch within it, cannot be precifely afcertained by any general rule; becaufe both tides and floods rife to different heights, and have different force, in different places and circumftances. The ftrength above-mentioned may be fufficient for banks in common cafes; but in others, where a great body of water, or a powerful tide is to be oppofed, they may be, as the memoirs of the Berne Society (*tom.* II. *part* II. *pag.* 262) advife, four feet or more wide at the top, with a bafis proportioned to their height, as three and a half are to one; or, if it be defired to make them ftill more folid, as four to one; fo that if the bank be four feet and a half high, its bafis in the former cafe will be fourteen feet wide, and in the latter eighteen.

The Dublin Society for the advancement of agriculture informs us (Numb. XVII. *for April* 1737) that "Lord Limerick has recovered between four and five hundred acres of very rich falt marfh, at Dundalk in Ireland, and effectually fecured them from the fea, by fuch banks as are above defcribed; and by the fame method many hundred thoufand acres have been recovered from the fea in Cambridgefhire, Lincolnfhire, and other parts of England; not to mention the low lands of Holland; which are indeed fecured againft the violence of the fea by no other means.

"If there be a neceffity for making banks on a ftrand where nothing but fand can be met with, thofe banks fhould be large, and the flope very broad and extended; and if grafs-feed will not grow on them, let fea-weeds be planted. Thefe with fticking furze, ftraw, or loppings of trees, will help to keep the banks together."

But a better method, and more effectual, is given by Dr. Hales in the Philofophical Tranfactions, from the experience of Dr. Wark, a clergyman in Scotland. The method confifts in fixing to the bottom of the channel, a breadth of furze proportioned to the force it is to refift. The fand or flime, as either abounds, will foon fettle among the branches of the furze; and when the firft bed of the furze is thus interwoven or covered, another bed of furze is to be laid on as before, and fo on, till the bank is raifed to a fufficient height. Dr. Wark affures us, that by this fimple method a bank was made near Holy-ifland fo ftrong, that it became a bar againft the fea itfelf.

"It fometimes happens, that the fea flows in through a narrow gut or paffage, by which the inland waters are difcharged, and then extends itfelf, and covers a great deal of ground. When this happens, if the inland waters cannot be diverted into another courfe, fince a paffage muft be left for their difcharge; let a ftrong fluice be fixed in the loweft part of the channel, with large piers of ftone, running out for its fupport, and a ftrong foundation of wood or broad ftones for the water to run over.* When this is done, let the banks of fand, or other foil near at hand, be made in the manner already mentioned, on each fide of the fluice.

"The reafon why it is advifed, in places where a fluice is to be made, to begin the work by this rather than by the bank, is, that while the tides have liberty to flow in and out at a great breadth, the fluice may be made in any part of the channel without being much incommoded by the tide; whereas if it be deferrred till the banks on each fide are made, the force of the tide, when confined to a narrow paffage, will tear up all before it, and render the building of the fluice impracticable: and upon the fame account, the banks fhould be begun at the loweft part of the channel, and carried on from thence to the upper grounds.

"If, by any accident, the waters fhould fwell fo high as to overflow and tear the banks, farther mifchief may be prevented by fixing with all expedition, a fail-cloth, or fheet of linen at the bottom of the bank, where the flood breaks in; for if this be done in time, the water will flow over the cloth, without wafhing away the bank.

"In every improvement, the expence fhould be particularly confidered. That of making banks in this method is fmall. In low grounds the foil is foft, and dug with eafe, and all the work may be done with the fpade and fhovel, without pick-axes, which muft be ufed in upland ground; and the materials are on the fpot. All the charge will be often more than repaid by the firft years improved crop of grafs, and the fafety of the meadows. The produce of fucceeding years will amount much higher, and the hufbandman will be out of all danger for the future of having his lands overflowed and fpoiled. Farmers have frequently fuftained more damage from the hay deftroyed in one feafon by floods, than the whole value of what it would have coft them to inclofe and bank their meadows, and free them from all hazards."

BANNOCK, an oat-cake kneaded with water only, and baked in the embers.

BANQUET, is that fmall part of the branch of the bridle that is under the eye, which being rounded like a fmall rod, gathers and joins the extremities of the bit to the branch, and that in fuch a manner, that the banquet is not feen, but covered by the cap, or that part of the bit which is next the branch.

To BAR *a vein*, implies an operation in farriery performed in the following manner: they open the ſkin above and below the place where the operation is to be performed, and after freeing the vein from the ſurrounding parts, they tie it at thoſe openings with two ligatures; after which they open the vein between the ligatures in order to diſcharge the blood. This operation is performed upon the veins of a horſe's leg, and other parts of his body, in order to ſtop the courſe, and leſſen the quantity of malignant humours that prevail there.

BARB, a general name for horſes imported from Barbary.

The cheſt of the barb is long and ſlender, riſes beautifully from the withers, his mane little, his head well ſhaped, ſmall, and lean; his ſhoulders flat and ſlender; his withers narrow and plump; his back ſtrait and ſhort; his flanks and ſides round, and not bellying out; his haunches firm and well ſhaped; his croup generally ſomewhat long, and his tail placed pretty high; his thigh well ſhaped, and ſeldom flat; his legs handſome, well ſhaped, and without long hair at the paſtern joint; his foot well made, but his paſtern often long.

Barbs are of all colours, but generally brown. They are ſomething negligent in their goings; but, properly encouraged, ſhew an amazing ſwiftneſs and vigour: they are very light and fit for running; and ſeem of all others the fitteſt to breed from. It were, however, to be wiſhed that they were a little taller, the largeſt rarely exceeding fourteen hands; and one of fourteen hands and an inch, is very extraordinary. Experience has, however, ſhewn, that in England, France, &c. they get colts larger than themſelves. Among the barbs, thoſe from the kingdom of Morocco are accounted the beſt, except the mountain barbs. Thoſe of the reſt of Mauritania are inferior to them, as are alſo thoſe of Turkey, Perſia, and Armenia. All horſes from a hot climate have a ſmoother coat than others. *Buffon's Hiſtoire Naturelle, tom.* IV.

BARBELS, or *barbs*, are excreſſences or knots of ſuperfluous fleſh, growing under the tongue, and may be ſeen by drawing it aſide.

They are cured by cutting them cloſe off, and waſhing the wounded part with brandy, or ſalt and water. *Bartlet's Farriery, pag.* 262.

BARBERY, or pipperidge-buſh, a ſhrub that grows naturally in the hedges in many parts of England; it is alſo cultivated in gardens for its fruit, which is pickled, and uſed for garniſhing diſhes. This ſhrub riſes with many ſtalks from the root, to the height of eight or ten feet. The flowers appear in May, and the fruit ripens in September.

Theſe ſhrubs are propagated either by ſuckers, of which there are plenty about the old roots, or by layers.

The beſt time for laying down the branches, is in the autumn, when their leaves begin to fall; the young ſhoots of the ſame year are the beſt for this purpoſe. Theſe will be rooted by the next autumn, when they may be taken off, and planted where they are deſigned to remain. *Miller's Gard. Dict.*

A fooliſh ſuperſtition has for many ages prevailed among the farmers in many parts of England, namely, that a field of corn will always be blaſted, if a barbery-ſhrub grows in any one of the hedges that ſurround it. But theſe ridiculous notions are now pretty well baniſhed from the generality of our huſbandmen, and it is hoped the reſt will ſoon follow their example.

BARBS. *See the article* BARBELS.

BARG, a horſe-way up a ſteep hill.

BARING *of trees. See the article* ABLAQUEATION.

BARK, the exterior part of trees, ſerving them for a ſkin or covering.

Dr. Agricola ſays, that the bark of a tree may be compared to the ſkin of an animal, which is deſigned for the preſervation of the inward parts. It is generally of a ſpongy texture, and communicates with the pith, by a multiplicity of ſmall fibres paſſing between the capillary tubes, of which the wood conſiſts; ſo that the roots having imbibed the proper nutriment of the tree, it is carried up by the warmth of the ſun, through the fine arterial veſſels of the tree to the top of it; and being there condenſed by the cold, it returns by its own gravity down by the veſſels which lie between the wood and the inner bark, which perform the office of veins; and as it paſſes by leaves ſuch part of its juices as the texture of the bark will receive, and requires for its ſupport.

Some are of opinion, that the ſoft whitiſh rind, or ſubſtance which lies between the inner bark and the wood, performs the office of veins; and ſome call this a third bark, ſuppoſing it to differ from the other only in having its fibres cloſer; adding that this is the part which contains the liquid ſap, gums, &c. found in plants during the ſpring and ſummer months, and which hardening by degrees, is imperceptibly conveyed into the woody part of the tree, forming every year a new circle of wood between the bark and the trunk. Theſe circles are not equally thick, that circumſtance depending on the fertility of the year.

The bark of trees in general, and eſpecially that of the oak, contains a very rich ſalt, extremely uſeful in vegetation. One load of oak bark laid in a heap and rotted, after the tanners have uſed it for dreſſing their leather, will do more ſervice to ſtiff cold land, and its effects will laſt longer, than two loads of the richeſt dung. Mr. Miller ſays it is much better for cold, ſtrong land, than for light, hot ground, if it be uſed alone, as taken from the tan-yard; becauſe it is of a warm nature, and will looſen and ſeparate the earth ſo effectually, that, by only uſing it two or three times, a ſtrong ſoil, not eaſy to be wrought, will be rendered perfectly light and looſe: but by mixing it with earth of a nature contrary to that which it is intended to correct, and in a proportion ſuited to the nature of the ſoil it is to be laid on, it will prove a fine manure for almoſt any land; its ſalts being ſuch as will always fertilize the ground. Mr. Mortimer aſſerts, that it will alter and change the very nature of the ſoil, and turn it into a very rich black mould. *Mortimer's Huſbandry, vol.* I. *p.* 121.

It neceſſarily abounds in vegetable parts, derived from the tree to which it once belonged; and cannot but be ſtrongly impregnated with animal juices, as it lies a long time in the tan-vats, with the ſkins and hides of animals: circumſtances which muſt render it ſingularly beneficial to all poor lands.

If laid on graſs, it ſhould be ſpread ſoon after Michaelmas, that the winter rains may waſh it into the ground: for if it be laid on in the ſpring, it will be apt to burn the graſs, and, inſtead of improving, will do it a conſiderable injury for that ſeaſon. When uſed for corn land it ſhould be ſpread before the laſt ploughing, that it may be turned down for the fibres of the corn to reach it in the ſpring; for if it lies too near the ſurface, it will forward the growth of the corn in winter; and in the ſpring, when the nouriſhment is chiefly wanted to encourage the growth of the plants, it will be ſo nearly conſumed, that the corn will receive very little advantage from it.

Mr. Bradley tells us, that he adviſed a gentleman to whom a conſiderable quantity of bark was left upon the extirpation of the leaſe of a tan-yard, to lay ſome of it upon a piece of ſtubborn four land, which he did with ſuch ſucceſs, that his product was admired by all the gardeners and farmers in the neighbourhood. For ſuch ground, he thinks it ſhould be mixed with a ſandy ſoil; and that one third of bark to two thirds of ſand, will be a very ſufficient proportion for clays; laying on about one hundred and fifty cart loads upon an acre. *Bradley's Huſbandry, pag.* 90.

All barks or rinds of trees, though not of ſo high a value as that of the oak, which is the ſort principally uſed by tanners, muſt of neceſſity enrich either corn or paſture ground, if broken into ſmall pieces, and laid upon it. They muſt needs be much richer than the mould or earth, uſually found in the bodies of old, large, hollow, willow-trees, though this is juſtly eſteemed very efficacious. *Worlidge's Huſbandry, pag.* 84.

For the manner of making hot-beds with tanner's bark, *ſee the article* TAN.

BARK-BOUND, a diſeaſe common to fruit-trees, and may be cured by making a ſlit through the bark, from the top of the tree to the bottom, in February or March; and if the gaping be pretty conſiderable, fill up the

the rift with cow-dung. *Mortimer's Husbandry, vol.* II. *pag.* 85.

BARKING *of trees*, the operation of ftripping off the bark or rind, particularly that of the oak, for the ufe of tanners.

It is neceffary in our climate to perform this operation in the month of May, becaufe at that feafon only, the bark is, by the great quantity of fap, feparated from the wood. This alfo renders it neceffary to fell the trees in that month; but by this method the timber is much lefs valuable than it would be if felled after the fall of the leaf.

BARLEY, a fpecies of grain well known in England, and of which Mr. Miller has enumerated four fpecies.

1. The fpring barley, which has a double row of beards or awms ftanding erect. This is the fort principally cultivated in England, and of which the farmers make two forts, viz. the common, and the rath-ripe barley: but thefe two forts are in reality the fame; for the rath-ripe is only an alteration of the common barley, occafioned by being long cultivated upon warm gravelly lands. The feeds of this, when fown in cold or ftrong land, will, the firft year, ripen near a fortnight earlier than the feeds taken from ftrong land, and therefore the farmers in the vales generally purchafe their feed barley from the warm lands; for if faved in the vales two or three years, it will become full as late in repening as the common barley of their own product: on the other hand, the farmers on the warm land are alfo obliged to procure their feed barley from the ftrong land, otherwife their grain would degenerate in bulk or fulnefs, which, by this change, is prevented. This fort of barley is eafily diftinguifhed by the two orders of beards or awms, which ftand erect; the rind is alfo much thinner, and therefore efteemed better for making malt.

2. The long-eared barley, which is cultivated in many parts of England, and is an exceeding good fort; but fome farmers object to this barley, becaufe they fay the ears being long and heavy, it is more apt to lodge. This fort of barley hath its grains regularly ranged in a double row, lying over each other, like the tiles on a houfe, or the fcales of fifh. It has no beards or awms; but its rind is very thin, and therefore efteemed for making malt.

3. The fprat barley, called alfo Battledore, Fulham, and Patney barley, from the great quantities cultivated in the neighbourhoods of thofe places, has fhorter and broader ears than either of the former forts; the awms or beards are longer, which tend greatly to preferve it from the bird, and the grains placed clofer together. This feldom grows fo tall as the other fpecies; the ftraw is alfo coarfer, and therefore not fo good fodder for cattle.

4. The winter barley, called alfo fquare-barley, bear-barley, or big, is feldom cultivated in the fouthern parts of England; but in the northern counties, and in Scotland it is the general fort fown, as being much hardier than the other fpecies. There are two forts of this barley, the one with four rowsof grains, and the other with fix, the latter of which is commonly diftinguifhed by the name of barley-big. The grain is large and plump, but the rind or chaff of it being thicker than that of either of the preceding forts, it is lefs efteemed for making malt, and therefore not cultivated in the fouthern parts of England, where the forts which are fo much better for that purpofe thrive fo well.

Both the four and fix rowed barley are generally fown in the autumn, nearly at the fame time with wheat, not only in temperate climates, but alfo in very cold countries; their hardinefs being fuch as to bear the winter's frofts, even in the mountainous parts of the northern regions. In hot countries they are fown in January, February, and March.

All the other forts are fown in the fpring of the year in a dry time; in fome very light land barley is fown early in March, but, in ftrong clay foils, not till April, and fometimes not till the beginning of May; but when it is fown fo late, if the feafon does not prove very favourable, it is very late in autumn before it is fit to mow, unlefs it be the rath-ripe fort, which is often ripe in nine weeks from the time of fowing: though Mr. Lifle is of opinion, that this, in particular, ought to be fown early, for otherwife it will grow very thin. He likewife thinks, that it fhould be fown on better ground than the other barley, becaufe as it ripens in a fhorter time it may be naturally fuppofed to exhauft the nutritive juices of the earth fafter than other corn. But it is faid by others, that thefe nutritive juices in almoft any tolerable foil, will probably hold out long enough to feed a crop of fo fhort a ftanding as this is, though they might not fuffice for corn which fhould remain longer upon the ground; and it is added, that about Patney in Wiltfhire, they fow the pooreft fandy ground with rath-ripe barley. *Lifle's Hufbandry, vol.* I. *pag.* 271.

Mr. Lifle adds, that he himfelf in the year 1707, fowed in Hampfhire, rath-ripe barley in very poor white ground, and fome of the fame corn in good ftrong clay land. No rain fell to bring it up till June; after which there were frequent fhowers, and plenty of rain till harveft. His rath-ripe barley in the poor land was miferably bent, broken in the ftraw, and harled, or fallen down. In the ftrong clay land, the fame corn fuffered the fame injuries, though in a lefs degree: but the ftraw and leaves of the rath-ripe barley in both places blighted, and were full of black fpecks; their ears were thin, and their colour was loft; while the plants of late-ripe barley in an adjacent field were free from thefe fpots, and ftood upright with good ftrength. From this experiment he infers, that fince the clay land in the hilly country of Hampfhire, though in good heart, cannot, even in a moift year, fufficiently feed the ftraw of rath-ripe barley, fo as to enable it to ftand upright, but fuffers it to be languid and withering, this fort of corn is not proper for fuch places, and that it is better to fow late-ripe barley, even though three or four horfes extraordinary be provided againft fowing time, in order to get the corn into the ground a week before May begins. *Lifle's Hufbandry, vol.* I. *pag.* 272.

Another important obfervation made on the fame occafion, by the fame judicious farmer, was, that one half of the feed which fell deep came up without rain, while the reft did not fprout till after the rain came. The half which came up firft, could not, by reafon of the weaknefs of the ftems, wait for the ripening of the latter edge-grown corn, in the fame field; but its ftraw bent, broke, and was entangled, and the ears buried themfelves among the broad clover fown with the barley, fo that he was forced to cut it; not being able to ftay a week or ten days longer for the edge-grown corn to ripen: whereas the late-ripe barley ftood fo upright in its ftraw, that the corn which came up firft would ftay ten days for the edge-grown corn.

The fame gentleman had another evident proof, in the year 1706, that the ftraw of the rath-ripe barley is thinner and weaker than that of the late-ripe. All his rath-ripe barley, of which he fowed fifty acres in different forts of ground, and fome of it fide by fide with late-ripe barley, crumpled down in the ftraw, while the late-ripe barley of the fame forwardnefs and growth, ftood upright.

Upon the whole, Mr. Lifle, after obferving farther, that, if the ground be good, and the year a feeding one, rath-ripe barley is apt to run rank, and to fall while very green in the ear, which occafions the grain not to fill; concludes, in regard to this fort of corn, that it fhould always be fown early, that the land fhould not have a north expofure, and that the foil in which it is planted fhould be pretty good, either naturally fuch, or rendered fo by art; "for we know, fays he, that the poorer the ground is, the weaker and poorer the ftraw will be in all forts of corn; and if the rath-ripe barley has by nature a weaker and thinner ftraw than the late-ripe barley, and on that account is apter to crumple, to bend down, and to break in the ftraw before it is ripe; much more will it be apt to do fo, when the ftraw is made much thinner and weaker than naturally it would be, by the poverty of the ground it is fown in. It is very evident to me, that rath-ripe barley ought not to be fown on poor ground, and much lefs fo in cafe it lies declivous from the fun towards the north." *Lifle's Hufb. vol.* I. *p.* 273, 274.

The

The middle-ripe barley, as Mr. Liſle calls it, meaning the common ſpring barley, bears late ſowing, even upon ground declivous from the ſun, better than the rath-ripe ſort; but not near ſo well as the late-ripe, or common long-eared barley; nor will its ſtalk ſtand ſo long. Mr. Liſle was convinced from experience, that late-ripe barley will endure being ſowed when the ground is wetter than will do for the rath-ripe ſort, and that a bottom ground, or vale pent in between two hills, though ſhaded by one of them from the ſun, will, by means of the warmth and cloſeneſs of the air, often ripen corn as faſt as the ground that lies declivous to the ſun. In a field which he ſowed with the common ſpring barley, the loweſt part of which laid on a flat, ripened regularly, and even ſooner than another part of the ſame field which lay upon the ſide of a hill declivous to the ſun: but on that ſide of the ſame hill which ſloped from the ſun, the corn was more edge-grown, lay backward, and neither looked ſo white, nor was it ſo ripe. *Liſle's Huſbandry, vol.* i. *p.* 275.

The land which lies both very dry and healthy, and in which both mellowneſs and lightneſs are joined to a proper ſtrength of ſoil, is that which produces the beſt body, and thinneſt rinded barley; qualities which always recommend this grain, eſpecially to the maltſters. Such generally is the barley of the growth of the hilly countries. But poverty of ſoil is by no means requiſite in land, in order to its producing a plump and thin rinded barley: though it is allowed, that poor land which lies dry and warm, will bear better corn of this kind, than rich land in a cold and wet ſituation: for barley does not ſtand ſo much in need of ſtrength in the land, as of the healthineſs and warmneſs of the ſoil; though both are beſt where they can be had. *Liſle's Huſb. vol.* i. *p.* 281.

With regard to the choice of ſeed-barley, it is neceſſary to obſerve, that the beſt grain for ſowing is that which is not blackiſh at the tail, nor has a deep redneſs, but is of a pale lively yellow colour, intermixed with a bright whitiſh caſt, and if the rind be a little ſhrivelled, it will be ſo much the better; for that ſlight ſhrivelling occaſioned by its having ſweated in the mow, is a ſure indication that its coat is thin. The huſk of thick rind barley being too ſtiff to ſhrink, will lie ſmooth and hollow, even when the inſide flour has ſhrunk from it.

The neceſſity of a change of ſeed from time to time, by ſowing that of the growth of a different ſoil, is no where more evident than in the culture of this grain, which otherwiſe becomes coarſer and coarſer every year. But at all times in this, as well as in all other grain, the utmoſt care ſhould be taken that the ſeed be full bodied.

Mr. Liſle tells us, that in order to be ſatisfied of this, he took out of a heap of barley ſixty grains, of different ſizes, viz. twenty of the biggeſt, twenty of the middle ſize, and twenty of the ſmalleſt corns. Twenty of each ſort of theſe grains he planted in three pots, each filled with the ſame ſort of mould, which was very rich. In eight or nine days time, thirteen of the fulleſt bodied grains were come up, nine of the middle ſized, and only five of the ſmalleſt, and the plants of the plumpeſt corn exceeded thoſe of the others, both in colour and breadth of blade. In three days after, he found nineteen blades of the largeſt ſort come up, ſeventeen of the middle ſize, and thirteen of the ſmalleſt; and in three days more, the blades of the beſt and of the middle ſort were all come up, while only ſeventeen of the worſt had ſprouted, with ſuch manifeſt diſadvantage in colour and ſtrength in theſe laſt, as plainly ſhewed that many of them would not have come up at all in poor ground. *Liſle's Huſb. vol.* i. *p.* 283.

It is natural to ſuppoſe that barley will, like wheat, be benefited by being ſteeped before it be ſown: for as rain cannot be depended upon ſoon after the ſowing of ſpring corn, there is ſurely an equal reaſon for extending the practice of theſe ſorts of grain, as well as to thoſe which are ſown in the autumn. Liming indeed may hurt barley, if hot weather ſhould ſoon follow after the ſowing; but a little ſprinkling of ſoot bids fair for improving it, at leaſt it will prevent the inſects from preying upon the ſeed. The Rev. Mr. Elliot informs us, that a farmer, who was obliged to attend other buſineſs in the courſe of the morning, ſowed oats at break of day, and harrowed them in before ſun-riſing. The conſequence was, that the corn thus early ſown, out-ſtripped the other oats ſown on the ſame day after the ſun was up, had larger ears, and appeared every way better, though the ſpot in which they grew was the worſt part of the field. If the dew, when buried with the corn had this effect, it is reaſonable to ſuppoſe that a much greater would have been produced, had the ſeed been ſown in the evening, left all night to have been ſoftened with the dew, and then harrowed in, in the morning. *Elliot's Eſſays on Field Huſbandry, p.* 29.

Mr. Liſle alſo tells us, that a maltſter in Hampſhire having taken lands in the beginning of May, and no barley being to be had, he, by the perſuaſion of his malting-ſervant, made uſe of barley he had wetted, and was juſt well chitted or ſprouted; this corn came up well, and produced as good a crop as any ſown that year. *Liſle's Huſbandry, vol.* i. *p.* 284.

Barley is generally ſown either after a fallow, or on an erſh or ſecond crop. If after a fallow, the land muſt be ploughed at leaſt three times; and at the firſt ploughing, it ſhould be laid in ſmall ridges, and in that manner remain during the winter for the froſt to mellow it: but if another ploughing can be given it in January, or in the beginning of February, the ground will be ſtill much better broken and prepared. In March theſe ridges are ſplit, the ground is well harrowed, and laid as ſmooth as can be, and, if poſſible, it is ploughed again the ſame day, in order to ſow. But in ſtrong wet lands, the beſt way is to lay it round, and make deep furrows to receive the water.

Some at the time of twifallowing in June, make the land very fine, and ſow it with turneps, which they feed with ſheep in the winter; and in March they plough it up, and order it as before: but others, who take this method of ſowing turneps, give it only one ploughing in March, juſt before they ſow.

Thoſe who ſow barley upon an erſh, after wheat, plough up the wheat ſtubble in as dry weather as they can, as ſoon as the time of ſowing wheat is over, which is generally about the beginning of October, and lay three ridges into one, if they have dung to ſpread upon it: but if they have not, they plough it in ſmall ridges, as before directed, that it may be the drier, and be the better mellowed by the froſt: they then plough it up again in March, and order it as before. Some farmers injudiciouſly ſow their barley after oats, in which caſe, neither of theſe three ploughings ought by any means to be neglected; and the land will be in much better order if the firſt of them be given in October: or, if the harveſt be early, the weather dry, and the huſbandman can poſſibly find time to do it, he will improve his ground ſtill more, by ploughing it up before he ſows his wheat, juſt as harveſt is in: this will be half as good as a ſummer's fallow. But all years will not admit of this practice. *Mortimer's Huſbandry, vol.* i. *p.* 131.

Some ſow their barley on ſmall ridges, and others on broad lands; the latter cannot be laid too round.

Mr. Mortimer relates, that a farmer in Eſſex, who lived near a market-town, from whence he had good quantities of dung, uſed to ſow his land with barley and clover; reaped the corn at harveſt, fed the clover all the winter, and from ſpring till the middle of July, when he fallowed his ground. In the next ſpring he ſowed it again with barley and clover, and repeated every year this method, by which he had large crops. His land was a rich light mould, ſomewhat inclining to a gravelly bottom. *Mortimer's Huſbandry, vol.* i. *p.* 132.

A correſpondent of the editors of the *Muſeum Ruſticum* obſerves, that a few years ago he ſowed twenty-five acres of land, in fine tilth, with broad clover and barley; but the ſpring being backward and cold, and the ſummer wet, the clover got too forward, and overpowered the barley. At harveſt they were both cut together; and the clover being full of juice, occaſioned its being a tedious time before the barley could be houſed. When he got it into the barn, the men complained much of its threſhing ſo badly, that they could not undertake to do it unleſs he would double the price to them: as this could not be afforded, he ordered them to give it only a light beating, leaving the under corn in the ſtraw, together with the clover, for the cattle.

By this means he loſt half his crop by the clover; and what barley could be obtained was lean, and thin-bodied, fetching but a very indifferent price at market.

As this was not the firft lofs of the fame kind he had experienced, he was determined, if poffible, to find out fome remedy; and accordingly applied to a very intelligent farmer in the neighbourhood, who advifed him to fow his clover, for the future, a month after the barley, by which means it would not prove too rank. This advice he accordingly followed, and found it to anfwer extremely well; and has therefore, to his great advantage, continued the practice ever fince. He adds, that there is no danger of the clover failing, though the feafon fhould prove dry; and that the feed is to be fcattered on the ground without any farther care, there being no occafion to harrow or roll it; for the fmall blades of the barley will keep moifture enough in the land to fupply the fmall wants of the clover during its infant growth, and when the barley is off, it will thrive furprizingly. *Mufeum Rufticum, vol.* iii. *p.* 315.

It has been already obferved, that the ufual time of fowing is in March, April, or the beginning of May. It is generally thought moft advifable to fow light lands the earlieft, and to embrace the firft dry feafon that offers for doing it; dry weather being beft for moft fummer corn. Clayey grounds, and lands fubject to weeds, are thought to produce the beft crops when fowed late. Mr. Mortimer fays, that barley will do well when fown even about the middle of May, if the feed has been properly fteeped. *Mortimer's Hufb. vol.* i. *p.* 132.

The common method is to fow the barley feed with a broad-caft at two fowings; the firft being harrowed in once, the fecond is harrowed until the feed is buried; the common allowance of feed is four bufhels to an acre: but if the farmers could be prevailed upon to alter this practice, they would foon find their account in it; for if a third part of that quantity be fown, there will be a much greater produce, and the corn will be much lefs liable to lodge, as I (fays Mr. Miller) have many times experienced; for when corn, or any other vegetables ftand very clofe, the ftalks are drawn up weak, and thence incapable of refifting the force of the winds, or fupporting themfelves under heavy rains: but when they are at a proper diftance, their ftalks will be more than twice the fize of the other, and therefore are feldom laid. I have frequently obferved in fields where there has been a foot-path through their middle, that the corn, which has ftood thin on each fide of the path, hath ftood upright, when all the reft on both fides has been laid flat on the ground; and whoever will give himfelf the trouble to examine thefe roots near the path, will find them tiller out (*i. e.* have a greater number of ftalks) to more than four times the quantity of the other parts of the field. I have feen experiments made by fowing barley in rows acrofs divers parts of the fame field, and the grains fown thin in the rows, fo that the roots were three or four inches afunder in the rows, and the rows a foot diftant; the intermediate fpaces of the fame field were at the fame time fown broad-caft in the ufual way; the fuccefs was this: the roots which ftood thin in the rows tillered out from ten or twelve, to upwards of thirty ftalks on each root, the ftalks were ftronger, the ears longer, and the grains larger than any of thofe fown in the common way; and when thofe parts of the field, where the corn was fown in the ufual way, has been lodged, thefe parts fown thin have fupported their upright pofition againft wind and rain, though the rows have been made not only lengthways, but acrofs the lands, in feveral pofitions; fo that there could be no alteration in regard to the goodnefs of the land, or the fituation of the corn: where therefore fuch experiments have been made, and always attended with equal fuccefs, there can be no room to doubt which of the two methods is moft eligible, fince if the crops were only fuppofed to be equal in both, the faving two thirds of the corn fown is a very great advantage, and deferves a national confideration, as fuch a faving, in fcarce times, might be of very great benefit to the public. This faving of feed-corn muft be underftood to regard fuch as is fown broad-caft; for if it be fown in drills, an eighth part of the feed ufually fown will be fufficient for an acre of land, and the produce will be greater; for all forts of corn are naturally inclined to fend out feveral ftalks from each root, which they rarely fail to do where the roots are at a proper diftance, and have room; nor do ftalks grow in this cafe near fo tall, but are much ftronger than when they are near together, when they rarely have more than two or three ftalks; whereas thofe roots which have proper room, feldom have lefs than ten or twelve. I have had eighty ftalks upon one root of barley, which were ftrong, produced long ears, and the grain was better filled than any I ever faw grow in the common method of hufbandry, and the land on which this grew was not very rich; but I have frequently obferved on the fides of hot-beds in the kitchen gardens, where barley-ftraw has been ufed for covering the beds, that fome of the grains left in the ears have dropped out and grown, the roots have produced from thirty to fixty ftalks each, and thofe have been four or five times larger than the ftalks ever arrive at in the common way; but to this I know it will be objected, that although upon rich ground in a garden, thefe roots of corn may probably have fo many ftalks, yet in poor land they will not have fuch produce: therefore unlefs a greater quantity of feeds be fown, the crop will not be worth ftanding, which is one of the greateft fallacies that can be imagined; for to fuppofe that poor land can nourifh more than twice the number of roots in the fame fpace as rich land, is fuch an abfurdity, as one could hardly fuppofe any perfon of common underftanding guilty of; and yet fo it is: for the general practice is to allow a greater quantity of feed to poor land, than for richer ground, not confidering that where the roots ftand fo clofe, they will deprive each other of their nourifhment, and confequently ftarve themfelves, which is always the cafe when the roots ftand clofe, which any perfon may at firft fight obferve in any part of the fields where the corn happens to fcatter when they are fowing it; or in places where by harrowing, the feed is drawn in heaps, thofe patches will ftarve, and never grow to a third part of the fize as the other parts of the fame field; and yet, common as this is, it is little noticed by farmers, otherwife they furely would not continue their old cuftom of fowing. I have made many experiments for feveral years in the pooreft land, and have always found that all crops, which were fown or planted at a greater diftance than ufual, have fucceeded beft upon fuch land; and I am convinced if farmers could be prevailed upon to quit their prejudices, and make trial of this method of fowing their corn thin, they would foon fee the advantage of this hufbandry. *Miller's Gard. Dict.*

It is a common practice in fome parts to fcatter the dung of pigeons, poultry, &c. over barley and other corn, after the corn is fown; but if this method be purfued, care fhould be taken to fcatter the dung immediately; becaufe then the fhoot will eafily make its way through: but when laid on later, it burns up, and eats the blades of the young plants. *Mortimer's Hufbandry, vol.* i. *p.* 133.

It too often happens from unfavourable weather, and an extremely dry fpring, that it is impoffible by the common method to break the clods, and prepare the ground fufficiently for fowing barley; in which cafe it has been the ufual method to break the clods with a large beetle, called, from its ufe, a clotting-beetle. But this being a very chargeable and tedious method of preparing land, induced the ingenious Mr. Randall of York, to conftruct an inftrument, which he calls a fpiky roller, by the affiftance of which a large quantity of land may, in fuch a dry feafon, be foon reduced to an exceeding fine tilth, with very little trouble. The reader will find a full account of this ufeful inftrument, the manner of making and ufing it, together with a figure of the roller, under the article Spiky Roller.

After the barley is fown and harrowed in, the ground fhould be rolled after the firft fhower of rain, to break the clods and lay the earth fmooth; which will render it better to mow the barley, and alfo caufe the earth to be clofer to the roots of the corn, which will be of great fervice to it in dry weather.

And alfo when the barley has been up three weeks or a month, it will be a very good method to roll it over with a weighty roller, which will again prefs the earth clofe to the roots of the corn, and thereby prevent the fun and air from penetrating the ground, which will be of fingular fervice in dry feafons; and this rolling of it before it ftalks, will caufe it to tiller out into a greater number of ftalks; fo that if the plants fhould be thin, this will caufe them to fpread fo as to fill the ground, and likewife ftrengthen the ftalks. *Miller's Gard. Dict.*

If the corn grows too rank as it is ſometimes thought to do in a wet ſpring, mowing is then much better than feeding it; becauſe the ſcythe takes off only the rank tops, but the ſheep feed upon all indifferently: nor ſhould they even in any caſe be left upon it too long, becauſe being particularly fond of the ſweet end of the ſtalk next the root, they will bite ſo cloſe as to injure the future growth of the plant.

Barley is ripe when the red roan, as the farmers call it, meaning a reddiſh colour on the ear, is gone off, when the ears droop, and fall, as it were, double againſt the ſtraw, and the ſtalks have loſt their verdure. If it be full of weeds it muſt lie in the ſwarth till they are dry. It is not apt to ſhed; but in wet weather it will be apt to ſprout or grow muſty; and therefore every fair day after rain it ſhould be ſhook up and turned; and when it is tolerably dry, let it be made up into cocks; but be ſure never to houſe it till thoroughly dry, leſt it mow-burn, which will make it malt worſe than if it had ſpired in the field. The common produce of barley is two or three quarters upon an acre. *Mortimer's Huſbandry, vol.* i. *p.* 133.

Mr. Liſle ſays that poor thin barley and oats ſhould be cut a little ſooner than if the ſame plants were ſtrong and vigorous; for that the ſtraw, when the plants are full ripe, will not ſtand againſt the ſcythe. In this caſe the barley, in particular, muſt lie in ſwarth till it is thoroughly dry. Some of his barley, which lay out in ſwarth five or ſix days in very fine weather, though both blighted and edge-grown, grew plump, and acquired very near as good a colour as the beſt. He reckons ſhort ſcythes the beſt for mowing lodged or crumpled corn, becauſe they miſs the feweſt plants; and obſerves that a bow upon the ſcythe, which will carry the ſwarth away before it, is preferable to a cradle, the fingers of which would be pulled to pieces by the intangled corn, in drawing back the ſcythe. *Liſle's Huſbandry, vol.* i. *p.* 335.

Mr. Du Hamel tells us, that a farmer at Acou, obſerving that the chief hopes of more than common ſucceſs by means of the new huſbandry, were founded on the frequent ſtirring of the ground while the corn was in it, and on allowing each plant ſufficient ſpace to extend its roots, and thereby collect the more nouriſhment, tried an experiment which appeared to him very proper to diſcover whether the effect would anſwer. He carefully cultivated a grain of barley, which grew by chance in his vineyard. This plant, ſaid he, ſtands diſtant from any other; it can extend its roots every way; it is in a rich ſoil, and cannot want for food: by joining frequent culture to theſe advantages, this plant of barley, according to the principles of the new huſbandry, ought to yield a ſurprizing increaſe. His reaſoning was juſt, and the experiment confirmed it; for this ſingle grain of barley produced two hundred ears, and about thirty ſtalks which had no ears. Some of the ſtalks were four feet high, and moſt of them three. Mr. Du Hamel counted twenty-four grains in a middling ear. Thus one grain, planted in a good ſoil, and well cultivated, produced 4800 grains; and the ſtraw of this ſingle plant of barley made of itſelf a ſheaf. *Tranſlation of Du Hamel's Huſb. p.* 113.

We have already obſerved, under the article SOAP ASHES, that Sir Hugh Platt, by ſpreading that manure over his land, had a ſurprizing crop of barley, the plants of which were of a prodigious ſize. An ear of this barley is delineated in its natural ſize, Plate III. Fig. 1.

BARM, yeaſt, or the thick cruſt that riſes on the ſurface of beer, while it is fermenting.

BARN, a covered place or houſe for laying up any ſort of grain, hay, or ſtraw.

Every farm ſhould be furniſhed with barns proportioned to the quantity of corn it produces, which will be a great advantage to the farmer. The barns ſhould have a dry ſituation, and be properly placed in the farm-yard, but not quite contiguous to the houſe for fear of fire.

A barn is uſually made of wooden frames covered with planks of oak, or built of brick or ſtone, which ever the country affords in the greater plenty; and in either caſe there ſhould be ſuch vent-holes, or openings, in its ſides or walls, as to afford free admittance to the air, in order to prevent the mouldineſs that would otherwiſe from the leaſt dampneſs lodging in the corn. The gable ends may be always of brick or ſtone, for the ſake of greater ſolidity, and the whole may be roofed with thatch or tiles, as is moſt convenient. The ſize of the barn ſhould be proportioned to the crop uſually produced by the land to which it belongs. Two large folding doors ſhould face each other, one in each ſide of the building, for the convenience of carrying in or out a waggon-load of corn in ſheaves; and theſe doors ſhould be of the ſame breadth with the threſhing-floor to afford the more light and air; the former for the threſhers, and the latter for winnowing. Over the threſhing-floor, and a little above the reach of the flail, poles are often laid a-croſs from one beam to another, to form a kind of upper floor, upon which the threſher may throw his ſtraw or haulm, to make an immediate clearing, till he has time to ſtow it more properly elſewhere: and on the outſide, over the great doors, it will be right to form a large penthouſe, made to project ſufficiently to cover a load of corn, in caſe a ſudden ſtorm ſhould come on before it can be houſed; and alſo to ſhelter the poultry in the farm-yard, in great heat, or bad weather.

It is moſt adviſable, and indeed moſt commonly practiſed in countries which abound in corn, to have a ſeparate barn for wheat, another for ſpring-corn, ſuch as barley and oats, and a third for peas, tares, lentils, clover, ſaintfoins, &c.

Some art, which muſt be the reſult of practice, is neceſſary in placing and piling up the ſheaves in barns. But it may not be uſeleſs to obſerve, that it is always neceſſary to preſs them as cloſe to the walls of the barn as poſſible, ſo as not to afford the leaſt room for rats, or other vermin to creep in between them: for if they once get admittance they will ſoon penetrate further, lodge themſelves in the mow, and do prodigious damage to the corn. Where this misfortune happens, the only remedy is to take down the mow, kill the vermin, and pile it up a-new.

But the floor, or threſhing place, is the principal part of every barn, and therefore the greateſt care ought to be taken in making it. In order to this, the ſurface of the intended threſhing place is dug away to the depth of about ſix inches, and the earth thus taken out, after being well cleared of ſtones, is mixed with the ſtrongeſt clay that can be procured, and with the dung of cows or oxen. This mixture is then worked together with water, till it is of the conſiſtence of ſtiff mortar, and the compoſt thus made is ſpread as ſmooth as poſſible with a trowel, upon the ſpot from whence the earth was taken. As it cracks in drying, it muſt be beaten down with great force; or rolled with a heavy roller till all the crevices are filled up; and this muſt be continued till it is quite ſolid, hard, and firm.

The beſt barn-floor, both for threſhing and for keeping corn, is that which is drieſt, ſmootheſt, moſt completely ſolid, and conſequently freeſt from cracks and holes, in which inſects and vermin may ſhelter themſelves, and even breed. The ancients were remarkably careful in this reſpect, as we learn from Cato, Varro, and Columella, the laſt of which excellent huſbandman relates particularly the great pains they took, firſt to dig up the ground to ſome depth, in order to moiſten it with freſh lees of oil, but not with any that had ſalt in them; then to mix it thoroughly with chaff, and ram it down as cloſe as poſſible; afterwards as it dried, to ſtop all the cracks and crevices that appeared; to continue beating it down with great force, to render it quite level; and, laſtly, to ſtrew it again with chaff, which they trod in, and then left it to be completely dried by the ſun. All theſe writers agree, that the lees of oil, thus uſed, prevent the growth of weeds in theſe floors, and contribute to preſerve the corn from being plundered by the mice and ants. Their barns were always ſeated high, and as dry as poſſible.

A floor made in the above manner muſt be greatly preferable to either ſtone, or the earthen floors, too common in many parts of England, and from which ſuch dampneſs has been communicated to the corn, as has rendered wheat, for example, ſixpence a buſhel the worſe, either for keeping or exporting.

Boarded threſhing-floors, made of ſound, thick, well ſeaſoned planks of oak, are excellent for ſervice, will laſt a long time, and may be converted into good floorings for rooms, by planing them down, after they are become two uneven for the purpose originally intended.

BARNACLES, horse-twitchers, or brakes, are a sort of instruments used by farriers to put upon horses noses, when they will not stand quietly, to be shod, blooded, or dressed.

There are several sorts of barnacles, the common sort are rollers of wood, bound together, with the horse's nose between them. Another sort have handles, and are therefore termed pincers, to distinguish them from the foregoing. And a third sort are held together at the top by a ring inclosing buttons, having the top buttons held by an iron pin riveting through them.

BARREN CORN, a name given to a distemper in corn, by M. Aimen, who first observed it. The ears of wheat or rye, the species most subject to this distemper, which are thus affected, are long, lean, and white; in some the stamina, or small threads in the middle of the flower, are dry, transparent, and horned; the female organs are small, whiter, and less velvetty, than in healthy ears: in others, the filaments are swelled, the apices, or knobs on the tops of the stamina, void of dust, or farina, and the stigmata badly unfolded. The stigmata of all the blossoms of an ear are sometimes dried and parched; at other times the apices are swelled.

M. Aimens thinks, with Theophrastus, that these accidents happen to such plants as grow with most vigour. Then, says he, the sap, which is powerfully conveyed into the leaves and other parts of the plant, prevents the organs of fructification from unfolding themselves.

He also imagines that frost may cause this accident, by particularly effecting the female organs: and he thinks, that a hot gleam of sun-shine coming after a hard shower may have the same effect. If this be the case, the distemper in question may be ranked with the parched and shrivelled corn, or perhaps with the empty-eared corn. Lastly, the same naturalist observes, that insects are sometimes, though very rarely, the cause of this distemper.

Barren Earth, a name given by some to the under stratum of earth, or that which lies below the stratum frequently turned up, and cultivated for the nourishment of plants.

This notion of the under stratum of earth being dead or barren, and will destroy every vegetable planted in it, seems to be founded on a mistake; for every kind of earth, whether it be upon or under the surface, is certainly capable of giving nourishment to plants, provided it be for some time exposed to the influence of the air, frosts, &c. in order to enable it to dispense its nutritive qualities. An earth seemingly barren dug out of a deep pit, will, if spread on the surface, and properly stirred and exposed, be soon in a condition of bearing plants, and even much more so than the earth, which having been long at the surface, is almost exhausted, by the number of vegetables it has successively nourished. The notion of any earth being barren, merely because it is placed at a distance from the surface, is by the most intelligent naturalists exploded: its particles may perhaps want a proper arrangement, but it always possesses the vegetative quality. This opinion has been confirmed by repeated experiments; and a very remarkable one of this kind is related by a correspondent of the editors of the *Museum Rusticum*, *vol.* i. *p.* 100. &c. where the writer tells us, that he planted a quantity of potatoes in a piece of what was called dead barren earth, the upper bed having been taken away and spread on the adjacent land. Yet in this spot of ground dug two spits deep by the help of spades and mattocks, and the earth broke as fine as possible, he had a prodigious crop of remarkably fine potatoes; though the earth had not been exposed to the influence of the atmosphere above two months, it being dug in February, and the potatoes planted the latter end of March.

Barren Springs, a name given by husbandmen to such springs whose waters are injurious to land.

Most waters that flow from coal-mines, or through beds of sulphureous minerals, have this pernicious quality, destroying vegetables, instead of nourishing them. They have a harsh and brackish taste, are generally of a reddish colour, and deposit a reddish sediment in the channel through which they flow. They are much better when they have run some distance, than at their first breaking out on the surface of the earth. *Mortimer's Husbandry*, *vol.* i. *p.* 20.

BARS, the fleshy rows that run a-cross a horse's mouth, reaching almost to the palate. They are very distinguishable in young horses.

BARTH, a warm place, or pasture, for calves or lambs.

BARTON, *or* Barken, the yard of a house.

BASIL, the name of a plant, of which there are several species; but that which bears the largest leaves, especially if they are of a purplish colour, are reputed the best.

They are all annual and very tender plants, and must therefore be raised on a moderate hot-bed from seeds sown in March. When the plants are come up, they should be transplanted into another moderate hot-bed, observing to water and shade them until they have taken root; after which they should have plenty of air in mild weather, otherwise they will draw up very weak. In May they should be taken up with a ball of earth to their roots, and transplanted either into pots or borders, observing to shade them until they have taken root; after which, they will require no farther care, but to clear them from weeds, and refresh them with water in dry weather. Though these plants are only propagated from seeds, yet if you have any particular sort which you are desirous to increase, you may take off cuttings any time in May or June, and plant them on a moderate hot-bed, observing to water and shade them for about ten days; in which time they will take root, and in three weeks time be fit to remove, either into pots or borders, with the seedling plants. In September these plants will perfect their seeds, when those sorts which appear the most distinct should have their seeds preserved separate, for sowing the following spring. *Miller's Gard. Dict.*

BASON, a reservoir, or place for holding water either for the use or ornament of a garden.

In making basons, particular regard must be had to the soil of the garden; for in loose sandy land great care will be necessary in making the clay walls so as to hold water; but where the soil is loomy, or inclining to clay, there will be little difficulty in making basons, nor need the clay-wall be so thick. Where the ground is loose, the clay-walls at the bottom should not be less than two feet thick, and those on the sides one and an half. The clay should be well wrought over and trod when it is taken from the pit, before it is used in building the wall. The true sign of good clay is, that it be close and firm, without any mixture of sand, and that it be tenacious and fat in handling. It should be well worked before the clay is brought to the place, for if the clay be too long exposed to the sun and air, it will be less proper for use, especially if it be laid in small parcels.

The best time of the year for making basons is in autumn, when the sun is declining, and the weather temperate; for in the spring of the year, the drying east and north-east winds generally blow; so that the clay-walls, if not very carefully covered as fast as they are made, often crack in many places, so that the water finds a passage through them. The same inconveniency happens from the violent heat of the sun in summer; for when the clay dries very fast, it will be very difficult, if not impossible, to prevent its cracking.

When the ground where the bason is to be made, is dug out level, the clay must be brought in, and laid very carefully in the bottom, observing that no dirt or small stones be mixed with it; some water must also from time to time be thrown on the clay, while the men are treading it closely with their naked feet; after which it must be very well rammed. When the bottom is finished with clay, a layer of coarse gravel about four or five inches thick should be laid over it, which will greatly tend to secure the clay bottom, and render the water clear. But where the bason is large, so that the clay bottom is long in making, it should be covered with moist litter, to prevent its drying, which may be taken off when the whole is finished to lay on the gravel; but if part of the side walls be finished before this is done, it will be the better; because there may then be some water let into the bason, as soon as the gravel is laid, which will prevent the clay from cracking. After this the walls round the fides of the bafon muft be carried up with the fame care as above directed for the bottom, obferving alfo to cover the clay with litter while the work is carrying on, and afterwards to lay it with coarfe gravel; and as the walls are finifhed round, the water may be let in to fecure the walls from drying or cracking.

When the whole is finifhed, a ftratum of gravel four or five inches thick fhould be laid upon the clay, then a thin ftratum of good earth, and the whole covered with turf. The fand will prevent the grafs from rooting into the clay, and alfo keep out the froft. The turf on the fide of the bafon fhould be laid as far down as the water is apt to fall, that no part of the clay may be wholly expofed to the weather.

No trees or fhrubs fhould be fuffered to grow near a bafon, for their roots will penetrate through the clay walls, and occafion fiffures, through which the water will find an eafy paffage.

In fome countries where clay cannot be eafily procured, the walls of thefe bafons are frequently made with chalk, beaten into a foft powder, and made into a fort of mortar, with which the walls are made by ramming and working it very hard and firm. Thefe bafons hold water very well, if never fuffered to be dry any length of time; for whenever that happens the fun and winds by drying the chalk, caufe it to crack, and thefe cracks commonly extend through the thicknefs of the walls, fo as to let out the water.

Others build the walls of their bafons with bricks laid in terrafs, which is a good method for fuch places where the ground is loofe and fandy; becaufe the walls, when well built, will fupport the loofe earth from falling, or fettling away from the fides; but where terrafs is ufed, the walls fhould not be long dry and expofed; for the heat is apt to crack the terrafs.

Some make a cement of powdered tile and lime, two parts of the former to one of the latter, being very careful in the mixing of it not to add too much water, but to labour it well in beating, which is a principal thing to be obferved. With this cement they cover the furface of the walls of their bafons about two inches thick, laying on the plaifter, and being very careful that no fticks, ftraws, or ftones, are mixed with it: this plaiftering is generally performed in dry weather, and as foon as it is finifhed, it is rubbed over with linfeed oil, or bullocks blood, and the water let into the bafon as foon as poffible. This cement has the property of hardening under water, fo as to be equal to ftone, and will continue as long found.

But whatever the materials are made ufe of in building the walls, great care muft be taken to render them fo ftrong, as to enable them to refift the weight of the water; where, therefore, the ground about the bafon is not very folid, the walls fhould be thicker, and fupported on the backfide by buttreffes of the fame materials, placed at proper diftances: or, if the walls are made of clay, planks fupported by ftrong timbers, at proper diftances, fhould be placed fo as to fuftain them; otherwife there will be great danger of their being broken down, efpecially where the bafons are large enough for the waves driven by the wind to dafh forcibly againft the banks. *Miller's Gard. Dict.*

BASTARD *Alkanet*, called alfo *baftard gromill*, or *falfarn*, a weed common among corn, efpecially rye. It may be eafily known by its red roots, which yield a red tincture, and are ufed by the young girls in Sweden to colour their cheeks. From the root ufually rifes a fingle ftem about a foot high, rough, and branching out at the top. The flowers are fmall and white, furrounded with five long, narrow, hairy leaves, forming what the botanifts call the empalement of the flower cup, and fucceeded by four white rough feeds. *See a figure of this plant on* Plate III. Fig. 2.

BAVINS, brufh-faggots, or faggots made with the brufh-wood at length.

BAUM, a plant very common in the Englifh gardens. It is raifed either from feeds, or propagated by flips from its roots, which are perennial, though its ftalks are annual. The feeds fhould be fowed in the fpring; but the flips planted in October, that they may have time to get ftrength before the frofts come on. The roots alfo of this plant may be parted into fmall pieces, with three or four buds to each. Thefe fhould be planted about two feet afunder in beds of common garden earth, where they will foon fpread fo as to meet each other. The only culture they require is to water them till they have taken root, to keep the plant clean from weeds, and to cut off the dry ftalks in autumn; ftiring the ground between the roots. *Miller's Gard. Dict.*

BAUSON, the fame with badger. *See* BADGER.

BAY, a colour in horfes, fo called from its refembling the colour of a dried bay-leaf.

There are various degrees of this colour from the lighteft bay to the dark, which approaches nearly to the brown, but is always more gay and fhining. The bright bay is an exceeding beautiful colour, becaufe a bright bay horfe has generally a reddifh dafh, with a gilded afpect, his main and tail black, with a black or dark lift down his back. The middle colours of bay have alfo frequently the black lift, with black main and tail. And the dark bays have almoft always their knees and pafterns black; and we meet with feveral forts of bays, that have their whole limbs black from their knees and hocks downwards. The bays that have no lift down their backs, are, for the moft part, black over their reins, which goes off by an imperceptible gradation from dark to light towards the belly and flanks. Some of thefe incline to a brown, and are more or lefs dappled. The bay is one of the beft colours, and horfes of all the different kinds of bays are commonly good, unlefs when accidens happen to fpoil them while they are colts. *Gibfon on Horfes, vol.* I. *pag.* 44.

BAY *of a barn*, that part where the mow is placed. Hence fuch barns as have the threfhing-floor in the middle, and a fpace for a mow on each fide, are called barns of two bays, &c.

BAYARD, a bay horfe.

BAY-SALT, is falt made from fea-water by the heat of the fun only, without the affiftance of fire. The cryftals of this falt are much larger than thofe of the common falt, occafioned by the gentle evaporation of the watry particles; whence the cryftals have a fufficient time to fhoot, which they have not in the common method. From this circumftance bay-falt becomes much better for falting meat, &c. than the common.

BEANS, a fort of pulfe well known, and of which there are two fpecies, diftinguifhed by the names of the garden-bean, and the horfe-bean.

Garden-BEANS. There are feveral varieties of garden-beans, diftinguifhed among gardeners by different names, viz.

The Mazagan bean is the firft and beft fort of early beans at prefent known; they are brought from a Portuguefe fettlement of the fame name on the coaft of Africa. The feeds of this fort are fmaller than the horfe-bean, and as the Portuguefe are but flovenly gardeners, there is commonly a great number of bad feeds among them. If this fort be fown in October, under a warm hedge, pale, or wall, and carefully earthed up when the plants are advanced, they will be fit for the table by the beginning of May: the ftems of this fort are very flender, and therefore fhould be fupported by ftrings clofe to the hedge, or pale, to preferve them from the morning frofts, which are fometimes fevere in the fpring, and retards their growth: thefe beans bear plentifully; but they ripen nearly together, fo that there are feldom more than two gatherings from the fame plants. If the feeds of this fort are fowed two years in England, the feeds will become much larger, and not ripen fo foon, which is called a degeneracy.

The next fort is the early Portugal bean, which appears to be the Mazagan faved in Portugal; this is the moft common fort ufed by gardeners for their firft crop, but they are not near fo well tafted as the Mazagan.

The next is the fmall Spanifh bean; this will come in foon after the Portugal fort, and being a better tafted bean, fhould be preferred.

Then comes the broad Spanifh, which is a little later than the other; but coming in before the common forts, and being a good bearer, is frequently planted.

The

The Sandwich bean comes soon after the Spanish, and is almost as large as the Windsor-bean; but being hardier, is commonly sown a month sooner. It is a plentiful bearer.

The Toker bean, as it is generally called, comes about the same time with the Sandwich, and being a great bearer, is now frequently planted.

The white and black blossom-beans are also by some persons much esteemed; the beans of the former are, when boiled, almost as green as pease, and being a sweet bean, renders it more valuable: both these sorts are very apt to degenerate, if their seeds are not saved with great care.

The Windsor-bean is allowed to be the best of all the sorts for the table: when these are planted on a good soil, and are allowed sufficient room, their seeds will be very large, and in great plenty; and when they are gathered young, are the sweetest and best tasted of all the sorts; but the seeds of these should be carefully saved by pulling out such of the plants as are not perfectly right, and afterwards by sorting out all the good from the bad beans when they are out of the pods. This sort of bean is seldom planted before Christmas, because it will not bear the frost so well as many of the other sorts; it is, therefore, generally planted for the great crop to come in June or July.

Those beans which are planted early in October, will come up by the beginning or middle of November; and as soon as they are two inches above the ground, the earth should be carefully drawn up with a hoe to their stems, and this must be two or three times repeated, as the beans advance in height, which will protect their stems from the frost. If the winter should prove severe, it will be very proper to cover the beans with pease haulm, fern, or some other light covering, which will secure them from the injury of the frost: but this covering must be constantly taken off in mild weather, otherwise the beans will draw up so tall and weak as to come to little; and if the surface of the border be covered with tanner's bark, it will prevent the frost from penetrating into the ground to the roots of the beans, and be of great service to protect them from the injury they might otherwise receive.

In the spring, when the beans are advanced to be a foot high, they should be fastened up to the hedge with packthread, so as to draw them as close as possible; which will secure them from being injured by the morning frosts, which are often so severe in April, as to lay those beans flat on the ground, which are not thus guarded: at this time all suckers which come out from the roots should be very carefully taken off, for these will retard the growth of the bean, and prevent their coming early. When the blossoms begin to open toward the bottom of the stalks, the top of the stem should be pinched off, which will cause those first pods to stand, and thereby bring them forward. If these rules are observed, and the ground kept clean from weeds, or other plants, there will be little danger of their failing.

But lest the first crop should be destroyed by frost, it will be absolutely necessary to plant more about three weeks after the first, and so to repeat planting more every three weeks, or a month, till February; but those which are planted towards the end of November, or the beginning of December, may be planted on sloping banks, at a distance from the hedges; for if the weather should prove mild, these will not appear above-ground before Christmas; therefore will not be in so much danger as the first and second planting, especially if the surface of the ground is covered with tan to keep the frost out of the ground. The same directions which are before given will be sufficient for the management of these; but only it must be observed, that the larger beans should be planted at a greater distance than the small ones; as also, that those which are first planted must be put closer together, to allow for some miscarrying; therefore when a single row is planted, the beans may be put two inches asunder, and those of the third and fourth planting may be allowed three inches; and when they are planted in rows across a bank, the rows should be three feet asunder; but the Windsor-beans should have a foot more space between the rows, and the beans in the rows should be planted five or six inches asunder.

In the management of the later crop of beans, the principal care should be to keep them free from weeds and other plants, which would draw away their nourishment; to keep earthing them up, and when they are in blossom, to pinch off their tops, which, if suffered to grow, will draw the nourishment from the lower blossoms, and thereby prevent the pods from setting, so that only the upper parts of the stems will be fruitful. Another thing also should be observed in planting of the succeeding crops, namely, to make choice of moist, strong land, for the later crops; for if they are planted on dry ground, they rarely come to much, unless the summer proves wet.

These later crops should be successively planted about a fortnight after each other, from February to the middle of May, after which time it is generally too late to plant, unless the land be very strong and moist; for in warm, dry, light land, all the later crops of beans, are infested by black insects, which cover all the upper part of their stems, and soon cause them to decay.

When the seeds of the beans are designed to be saved, a sufficient number of rows should be set apart for that purpose, according to the quantity desired; these should be managed in the same way as those which are designed for the table; but none of the beans should be gathered. When the seed is ripe the stalks should be pulled up, and set upright against a hedge to dry, observing to turn them every third day, that they may dry equally; they may then be threshed out and cleaned for use, or otherwise stacked up in a barn, till there is more leisure for threshing them out; and afterwards the seed should be drawn over, to take out all those that are not fair, preserving the best for sowing, and the ordinary for feeding cattle.

It is a very good method to change the seeds of all sorts of beans, and not to sow and save the seeds long in the same ground, for they do not succeed so well; if, therefore, the land be strong where they are to be planted, it will be the best way to procure seeds from a lighter ground, and so *vice versa*; for by this means the crops will be larger, the beans fairer, and not so liable to degenerate. *Miller's Gard. Dict.*

Some few trials has been lately made in France to raise garden beans in open fields, on the principles of the new husbandry; and the result of these experiments sufficiently indicate that very large crops may be procured by that method, if properly practised. M. Du Hamel tells us, that M. Eyma planted, in December 1755, in a field near Bourdeaux, the common sort of garden beans, in a middling soil not dunged, but thoroughly ploughed a foot deep. The rows were two feet asunder, and the plants a foot distant from one another. These beans, which every one thought too thinly sown, being assisted by frequent hoeings, yielded a greater crop than any in the common way. When they began to ripen, M. Eyma gave the spaces between them a good ploughing, and on the twenty-third of June sowed in each of them a row of red kidney-beans, which came up very well. In a fortnight after he plucked up the garden beans, and gave the ground on which they stood a slight hoeing. These kidney-beans proved the finest he ever saw. He repeated the same experiment in 1756, and was rewarded with such success as surpassed his warmest expectations. *Traité de la Culture des Terres, tom.* V. *page* 81.

Horse BEANS, delight in a strong moist soil, and an open exposure, for they never thrive well on dry warm land, or in small enclosures, where they must, and are frequently attacked by the black dolphin fly: these insects are often in such quantities as to cover the stems of the beans entirely, especially all the upper part of them; and whenever this happens, the beans seldom come to good; but in open fields where the soil is strong, and the plants have room, this rarely happens.

These beans are usually sown on land which is fresh broken up, because they are of use to break and pulverise the ground, as also to destroy weeds; so that the land is rendered much better for corn, after a crop of beans, than it would have been before, especially if they are sown and managed according to the new husbandry, with a drill plough, and the horse-hoe used to stir the ground between the rows of beans, which will prevent the growth of weeds, and pulverize the ground, whereby a much greater crop of beans may, with more certainty, be expected, and the land will be better prepared for whatever crop it is designed for after.

The season for sowing beans is from the middle of February to the end of March, according to the nature of the soil; the strongest wet soil should always be last sown. The usual quantity of beans sown on an acre of land, is about three bushels, tho' this is double the quantity that need be sown, especially according to the new husbandry; but it will be necessary first to set down the practice according to the old husbandry, and then give directions for their management according to the new. The method of sowing is after the plough, in the bottom of the furrows; but then the furrows should not be more than five, or, at most, six inches deep. If the land be newly broken up, it is usual to plough it early in the autumn, and let it lie in ridges till after Christmas; then to plough it in small furrows, and lay the ground very smooth. These two ploughings will break the ground fine enough for beans, and the third ploughing is to sow the beans, when the furrows should be made shallow, as before mentioned.

Most people set their beans too close; for as some lay the beans in the furrows after the plough, and others lay them before the plough, and plough them in; so by both methods the beans are as close as the furrows are made, which is much too near; for when they are on strong good land, they are generally drawn up to a very great height, and are not so apt to pod as when they have more room, and are of a lower growth. The better way, therefore, is to make the furrows three feet asunder, or more, which will cause them to branch out into many stalks, and bear in greater plenty than when they are closer; by this method less than half the quantity of beans will be sufficient for an acre of land, and the air being admitted between the rows, the beans will ripen much earlier, and more equally than in the common way. *Miller's Gard. Dict.*

It has been already observed, that the black dolphin fly often destroys a crop of beans, and to prevent which, a correspondent of the editors of the *Museum Rusticum* proposes, that when these destructive insects are first seen on the tops of the beans, one or more persons, provided each with a scymeter or hanger, should be sent in the field, and strike off the heads of the beans. He adds, that by this means a crop has been often saved, this fly being seldom known to rise again when it once falls with the bean-top to the ground. *Museum Rusticum, vol.* III. *pag.* 233.

Another correspondent in the above work says, that as soon as the beans have got six leaves, the sheep should be turned in to feed among them; for they will eat up all the young weeds, even the melilot, without touching the beans. He adds, that the sheep may be kept every day among the beans till they are in blossom; but they must not be suffered to lie down. *Museum Rusticum, vol.* III. *pag.* 339.

When beans are intended to be planted according to the new husbandry, the ground should be four times ploughed before the beans are set, which will break the clods, and render it much better for planting. Then use a drill plough, to which a hopper is fixed for setting the beans, the drills should be made at three feet asunder, and the spring of the hopper set so as to scatter the beans at three inches distant in the drills. By this method less than one bushel of seed will plant an acre of land. When the beans are up, if the ground be stirred between the rows with a horse plough, it will destroy all the young weeds; and when the beans are advanced about three or four inches high, the ground should be again ploughed between the rows, and the earth laid up to the beans; and if a third ploughing, about five or six weeks after be given, the ground will be kept clean from weeds, and the beans will stalk out, and produce a much greater crop than in the common way. *Miller's Gard. Dict.*

A correspondent of the editors of the *Museum Rusticum*, has given the following method of cultivating beans in the vale of Aylesbury.

" First, says he, I plough two furrows on each outside of the land, but sow no beans in them: I afterwards drill, with an instrument hereafter described, the three next furrows: then I plough two furrows without drilling any beans in them, and so on, sowing three, and leaving two for intervals, till the land is finished.

" When the beans are about two or three inches high, I plough two furrows up each interval, turning the furrows from the beans, so as to make a ridge in the middle of each interval. I have a little plough on purpose for this use, about half the size of a common plough, which is drawn by one horse.

" This work should be done after a rain. This year, 1764, on the fifteenth of May we had rain. I therefore went to plough in the intervals on the eighteenth, and continued at plough till all were finished. On the eighth of June we had rain again. On the ninth of June I went to harrow the intervals with the triangular harrow hereafter described. About a week after that we had more rain. I then went to harrow again, going up the interval I went down before, and down that which I went up. This is what we call cross-tining. Thus my land is laid quite smooth, kept clear from weeds, and the beans have a fine loose mould to strike their fibres into; and it is by far the cheapest way of weeding beans.

Proportions of the above Drill (see Plate III. Fig. 3.)

" Diameter of the iron wheel twenty inches.

" Length of the box from A to B, twenty inches.

" Breadth of the box from B to C, ten inches.

" Depth of the Box from C to D, five inches and a half.

" Diameter of the cylinder of wood upon the iron axis of the wheel, four inches. This cylinder turns out the beans regularly.

" Length of the cylinder two inches and a half. On this cylinder are twenty-one holes, a quarter of an inch deep, and half an inch in diameter.

" E is a tongue, which drops upon the cylinder, and plays up easily: the tongue is half an inch thick, and three quarters wide. When a larger bean than ordinary comes, it will throw the tongue up, which naturally recovers its place again; and so the work goes on well and even. The tongue is represented separately with its notch at E: the notch does not go quite through it; it falls exactly on the holes of the cylinder.

" A lid takes off to put the beans into the box, and buttons down at F."

The triangular Harrow *described* (see Plate III. Fig. 4.)

" From A to B eighteen inches.

" The tines are nine inches a-part.

" The three tines in the cross-bar are only three inches and a half a-part.

" E, a cock which plays upon a pin, in which are three holes to hang the whipple tree in. If you put it into the upper hole the tines bear very heavy upon the ground: I generally use the middle hole." *Museum Rusticum, vol.* III. *pag.* 26.

When the beans are ripe they are reaped with a hook, as is generally practised for pease; and after having lain a few days on the ground, they are turned, and this must be repeated several times, until they are dry enough to stack; but the best method is to tie them in small bundles, and set them upright; for then they will not be in so much danger to suffer by wet, as when they lie on the ground; and they will be more handy to carry and stack, than if they were loose.

The common produce is from twenty to twenty-five bushels on an acre of land. *Miller's Gard. Dict.*

In the stiff, strong land, of the vale of Aylesbury, they annually sow a great many acres of horse-beans, all which they usually mow with a bare scythe, in swarth, as they call it; that is, they mow beans towards the beans; and each mower has a boy, who follows him with a fork,

fork, and lays the beans in wads. Their reaſon for mowing them in ſwarth, is on account of the largeneſs of their crops, and the beans leaning inwards: it is only when they have a thin crop, that they venture to mow them againſt their bending (this they call throating;) for ſhould they do it in common, it would break the hearts of the mowers, being as hard work again as the other.

When they mow in ſwarth, the workmen always keep the points of their ſcythes downwards, or they would ſtrip of great quantities of the beans.

In Hertfordſhire alſo, ſome farmers mow their beans with a ſcythe, and a three ribbed ſtrong cradle: this cuts a great deal in a day, lays the beans in regular rows, and ſaves the expence of a wa der; but in Buckinghamſhire they cannot uſe a cradle, their crops being in general ſo heavy, that the workmen could not carry over the ſwarth. *Muſeum Ruſticum, vol.* I. *page* 275.

The beans ſhould lie in the mow to ſweat, before they are threſhed out; for as the haulm is very large, and ſucculent, ſo it is very apt to give and grow moiſt; but there is no danger of the beans receiving damage, if they are ſtacked tolerably dry; becauſe the pods will preſerve the beans from injury; and they will be much eaſier to threſh after they have ſweat in the mow than before; and after they have once ſweated and are dry again, they never after give.

By the new huſbandry the produce has exceeded that of the old by more than ten buſhels an acre; for if the beans cultivated in the common method are obſervéd when they are in pod, it will be found that more than half way of their ſtems have no beans on them; for by ſtanding cloſe, they are drawn up very tall, ſo the tops of the ſtalks only produce, and all the lower part is naked; whereas in the new method, they bear almoſt to the ground; and as the joints of the ſtems are ſhorter, ſo the beans grow cloſer together. *Miller's Gard. Dict.*

Beans are a part of the diet of horſes, but chiefly uſed in mixture with bran or chaff, and by ſome upon the road, with oats; but they are moſtly given to coach-horſes and others that are conſtantly in draught. They afford the ſtrongeſt nouriſhment of all other grain, and will enable horſes to go through a great deal of heavy labour; but in ſome ſeaſons they breed a kind of vermin, which the farmers call a red bug, and is reckoned dangerous, and therefore the beſt way at ſuch times is to have them well dried and ſplit, which may, in ſome meaſure, deſtroy the malignity that is engendered in them. *Gibſon on Horſes, vol.* I. *pag.* 171.

Whoever has frequented the corn markets in London cannot but know that old horſe-beans ſell from ten to fifteen, and even more, per cent. dearer than new corn: becauſe new beans will, by their abundant crudity, give a horſe the gripes, and other diſorders equally fatal. To prevent ſuch conſequences, and at the ſame time ſave the difference between the expence of old and new corn, a correſpondent of the editors of the *Muſeum Ruſticum*, tells us that he made the following experiment.

He purchaſed a quantity of new beans, and filled a large tub with them, pumping in as much water as was neceſſary to wet them: after ſoaking about ten hours he drew off the water, and laid the beans in a heap on the floor. In this manner he ſuffered them to continue till they began to heat, when he ſpread them out thinner, moving them often with a malt ſhovel, and letting them lie in beds till the germ ſwelled and became turged. Then he carried them to a malt-kiln, and dried them gradually; and gave part of them to his horſes, as ſoon as cold.

By this preparation he aſſures us new beans will agree as well with cattle as any old corn that can be procured at the market.

The greateſt nicety in the operation is to prevent the beans from ſprouting, or malting, which would injure them, and not to dry them by too quick a heat. *Muſeum Ruſticum, vol.* I. *pag.* 327.

Kidney BEANS, called alſo *French beans.* There are a vaſt number of varieties of this plant brought from America, which it would be tedious, as well as ſuperfluous, to enumerate; eſpecially as ſome of the old ſorts are preferable to any of the new for the kitchen garden. There is, however, one ſort which deſerves to be particularly mentioned, and which has been long cultivated in the Engliſh gardens for the beauty of its ſcarlet flowers, from whence it is called the ſcarlet bean. This ſort hath twiſting ſtalks, which, if properly ſupported, will riſe to the height of twelve or fourteen feet; the leaves are ſmaller than thoſe of the common kidney-bean. The flowers grow in large ſpikes, and are much larger than thoſe of the common ſort; and of a deep ſcarlet colour; the pods are large and rough, and the ſeeds are purple marked with black. This ſort requires no other treatment than the common ſort, but the ſtalks ſhould have tall ſtakes put down by them to twine round, otherwiſe they will fall on the ground, which will ſoon cauſe them to rot. Although this ſort be chiefly cultivated for the beauty of its flowers, yet Mr. Miller recommends it as the beſt ſort for the table; and adds, that whoever makes trial of this, will, he is perſuaded, prefer it to all other kinds yet known.

The beſt ſorts for the table are the ſcarlet bloſſom bean, juſt mentioned, and a white bean of a ſmall ſize and ſhape, which appears to be only a variety of the ſcarlet, as it differs in no other reſpect, than the beauty of the flowers and ſeeds, being equal in ſize and flavour. And next to theſe is the large Dutch kidney-bean, which grows as tall as either of theſe, and muſt therefore be ſupported by ſtakes, otherwiſe their ſtalks will trail upon the ground and ſpoil. The ſort with ſcarlet flowers is preferable to this in goodneſs, and is alſo hardier; and though it will not come ſo early as ſome of the dwarf kinds, yet it will continue bearing till the froſt puts a ſtop to it in autumn, ſo that it is much preferable to either of them; for the pods of this ſort when old, are ſeldom ſtringy, and have a better flavour than the young pods of theſe ſorts, and will alſo boil greener.

There are two or three ſorts of kidney-beans cultivated with erect ſtalks, which want no ſupport, as they do not put out any twining ſtalk. Theſe are much cultivated by the gardeners for that reaſon, as alſo for their producing a great plenty of pods; but they are inferior in goodneſs to the others.

All ſorts of kidney-beans are propagated by ſeeds, which are too tender to be ſown in open air before the middle of April; for if the weather ſhould be cold and wet after they are in the ground, they will rot; or if the morning froſt ſhould happen after the plants are come up, they will be deſtroyed. The beſt way therefore to have early kidney-beans, where there is no conveniency of frames for raiſing them, is to ſow the ſeeds in rows, pretty cloſe, upon a moderate hot-bed, the latter end of March, or beginning of April. If the heat of the bed be ſufficient to bring up the plants, it will be enough; this bed ſhould be arched over with hoops, that it may be covered over with mats every night, or in bad weather. In this bed the plants may ſtand till they have put out their trifoliate leaves, when they ſhould be carefully taken up, and tranſplanted in warm borders near hedges, pales, or walls. If the ſeaſon proves dry at the time of removing them, the plants ſhould be gently watered to forward their taking new root, and afterwards managed in the ſame manner with thoſe ſown in the full ground. Theſe tranſplanted beans will not grow ſo ſtrong as thoſe which are not removed, nor will they continue bearing ſo long; but they will come a fortnight earlier than thoſe which are ſown in the full ground.

The firſt crop intended for the full ground, ſhould be put in about the middle of April; but theſe ſhould have a warm ſituation, and a dry ſoil, otherwiſe the ſeeds will rot in the ground; or if the weather ſhould prove ſo favourable as to bring up the plants, yet there will be danger of their being killed by morning froſts, which frequently happen in the beginning of May.

The ſecond crop ſhould be ſown about the middle of May. Theſe will come into bearing before the early kinds are over, and if they are of the ſcarlet ſort, will continue fruitful till the froſt deſtroys the plants in autumn, and theſe will be good as long as they laſt. The manner of planting them is to draw ſhallow furrows with a hoe, at about three feet diſtance from each other, into which you ſhould drop the ſeeds about two inches aſunder; then, with the head of a rake, draw the earth over them, ſo as to cover them about an inch deep.

If the ſeaſon be favourable, the plants will begin to appear in about a week's time after ſowing, and ſoon after will raiſe their heads upright; therefore when the ſtems are advanced above-ground, you ſhould gently draw a little earth up to them, obſerving to do it when the ground is dry, which will preſerve them from being injured by ſharp winds; but you ſhould be careful not to draw any of the earth over their ſeed leaves. After this they will require no further care, but to keep them clear from weeds, until they produce fruit, when the pods ſhould be carefully gathered two or three times a week; for if they are permitted to remain upon the plants a little too long, the beans would be too large for for eating, and the plants would be greatly weakened thereby.

The large ſorts of kidney-beans muſt be planted at a greater diſtance, row from row; for as theſe grow very tall, ſo if the rows are not at a farther diſtance, the ſun and air will be excluded from the middle rows, therefore theſe ſhould not be leſs than four feet and a half diſtance, row from row; and when the plants are about four inches high, the poles ſhould be thruſt into the ground by the ſide of the plants, to which they will faſten themſelves, and climb to the height of eight or ten feet, and bear plenty of fruit from the ground upward. The Dutch and French preſerve great quantities of the large Dutch beans for winter uſe, which they ſtew, and render agreeable, with gravy and other ſauces.

The beſt way of ſaving the ſeeds of theſe plants, is to let a few rows of them remain ungathered in the height of the ſeaſon; for if you gather from the plants for ſome time, and afterwards leave the remainder for ſeed, their pods will not be near ſo long and handſome, nor will the ſeed be ſo good. In autumn, when you find they are ripe, you ſhould, in a dry ſeaſon, pull up the plants, and ſpread them abroad to dry; after which you may threſh out the ſeed, and preſerve it in a dry place for uſe. *Miller's Gard. Dict.*

BEAR, or *bere*, a ſpecies of barley, called alſo winter barley, ſquare barley, and big.

This grain is chiefly cultivated in Scotland, the northern parts of England, and Ireland. It yields a very large return, but is not eſteemed ſo good for malting as the common barley, for which reaſon it is very little cultivated in the ſouthern parts of England. *See* BARLEY.

BEARD, the ſame with awm. *See* AWMS.

BEARD *of a horſe*, a name given to the hairs ſcattered on his under lip to the place where the curb of the bridle reſts.

BEARDED *oat-graſs*, the ſame with wild oats. *See the article Wild* OATS.

BEAR'S EAR, the Engliſh name for the plant generally called auricula. *See* AURICULA.

BEC, a ſmall brook, a rivulet, a little ſtream of water.

BEDS, a name given by many writers on the new huſbandry to the ſpaces occupied by the rows of corn; to diſtinguiſh them from the intervals, or open ſpaces between theſe beds, which they term alleys. *See* ALLEY.

Yellow ladies BEDSTRAW, *cheeſe-rennet*, *maid's-hair*, or *petty mugwort*, a weed very common in moiſt meadows and paſture grounds. Its ſlender ſtalks riſe to about a foot in height. The leaves come out in whorls, eight or nine together. They are long, narrow, and of a green colour. Two little branches generally come out near the top of the ſtalk, ſupporting a conſiderable number of ſmall yellow flowers, conſiſting of one petal, divided into four parts, and ſucceeded by two large kidney ſhaped ſeeds.

BEE, a ſmall and well known inſect, famous for its induſtry.

This uſeful and laborious inſect is divided by two ligaments into three parts or portions, the head, the breaſt, and the belly. The head is armed with two jaws and a trunk; the former of which play like two jaws opening and ſhutting to the right and left. The trunk is long and taper, and, at the ſame time, extremely pliant and flexible, being deſtined by nature for the inſect to probe to the bottom of the flowers through all the impediments of their chives and foliage; and drain them of their treaſured ſweets: but were this trunk to be always extended it would prove incommodious, and be liable to be injured by a thouſand accidents; it is therefore of ſuch a ſtructure, that, after the performance of its neceſſary functions, it may be contracted, or rather folded up; and beſides this, it is fortified againſt all injures by four ſtrong ſcales, two of which cloſely ſheathe it, and the two others, whoſe cavities and dimenſions are larger, encompaſs the whole. From the middle part or breaſt of the bee grow the legs, which are ſix in number: and at the extremity of the paws are two little hooks, diſcernible by the microſcope, which appear like ſickles, with their points oppoſite to each other. The wings are four, two greater and two ſmaller, which not only ſerve to tranſport them through the air, but, by the noiſe they make, to give notice of their departure and arrival, and to animate them mutually to their ſeveral labours. The hairs with which the whole body is covered, are of ſingular uſe in retaining the ſmall duſt that falls from the chives of the flowers, of which the wax is formed, as will be obſerved hereafter. The belly of the bee conſiſts of ſix rings, which ſlide over one another, and may therefore be lengthened or contracted at pleaſure; and the inſide of this part of the body contains the inteſtines, the bag of honey, the bag of poiſon, and the ſting. The office of the inteſtines is the ſame as in other animals. The bag of honey is tranſparent as cryſtal, containing the ſweet juices extracted from flowers, which the bee diſcharges into the cells of the magazine for the ſupport of the community in winter. The bag of poiſon hangs at the root of the ſting, through the cavity of which, as through a pipe, the bee ejects ſome drops of this venomous liquor into the wound, and ſo renders the pain more exceſſive. The mechaniſm of the ſting is admirable, being compoſed of two darts, incloſed within a ſheath that tapers into a fine point, near which is an opening to let out the poiſon. The two darts are ejected through another aperture, which, being armed with ſeveral ſharp beards like thoſe of fiſh-hooks, are not eaſily drawn back again by the bee; and indeed ſhe never diſengages them if the wounded party happens to ſtart and put her into confuſion; but if one can have patience to continue calm and unmoved, ſhe clinches thoſe lateral points round the ſhaft of the dart, by which means ſhe recovers her weapons, and gives leſs pain to the perſon ſtung. The liquor which at the ſame time ſhe infuſes into the wound, cauſes a fermentation, attended with a ſwelling, which continues ſeveral days; but that may be prevented by immediately pulling out the ſting, and enlarging the puncture, to let the venomous matter have room to eſcape.

Let us now conſider the generation, polity, and labours of theſe inſects, the true knowledge of which is very much owing to the modern invention of glaſs-hives, through which all the ſecrets of the community are laid open to a curious obſerver. Any perſon who carefully examines a hive at different ſeaſons of the year, will diſtinguiſh three ſorts of bees; of which the far greater number are the common working bees, who do all the buſineſs of the hive, and ſeem to be neither male nor female. The working bee is repreſented at C (Plate III. Fig. 5.) The ſecond ſort, called drones, are the males, and ſomewhat larger than the former (as A, Fig. 6.) they have no ſting, nor even ſtir from the hive, but live upon the honey prepared by the others. The third ſort is a much larger and longer bodied bee, of which there are often but one in every ſwarm or colony of young bees, who are from time to time detached from the hive in ſearch of another habitation. This large bee is what the ancients called the king, from the reſpect they always ſaw paid to it by the other bees; but being the female, the moderns more properly give the title of queen, or mother of the ſwarm. *See* Plate III. Fig. 7. B.

When

When thefe induftrious infects begin their works, it is obferved they divide themfelves into four parties, one of which is deftined to the fields to provide materials for the ftructure; the fecond works upon thofe materials, and forms them into a rough fketch of the dimenfions and partitions of the cells; the third examines and adjufts the angles, removes the fuperfluous wax, polifhes the work, and gives it its neceffary perfection; and the fourth is employed in bringing provifions to the labourers that build them, becaufe polifhing is not fo laborious. They begin their work at the top of the hive, continuing downwards to the bottom, and from one fide to another; and to make it the more folid they ufe a fort of tempered wax, refembling glue. The form of the cells of the honey-comb is hexagonal, which figure, befides what is common with a fquare and equilateral triangle, has the advantage of including a greater fpace within the fame furface.

The expedition of the bees in their labour is almoft incredible; for notwithftanding the elegance and juft proportions of the work, they are fo indefatigable, that they will, in one day, finifh a honey-comb a foot long, and fix inches broad, capable of receiving three thoufand bees.

It is not eafy to know, particularly, the manner in which they employ themfelves at this work, on account of the number of bees then in motion, by which means the eye can hardly diftinguifh any thing but confufion. We have however been able to obferve the following particulars: fome bees, bearing in each of their talons a little piece of wax, are feen running to the places where their companions are at work upon the combs; at their arrival they faften the wax to the work by means of the fame talons, which they apply fometimes to the right, and fometimes to the left. Each bee is employed but a fhort time on this work, when another takes its place.

While a part of the bees are at work in conftructing the cells, others are employed in perfecting thofe that are newly modelled, finifhing the angles, fides, and bafes, in fo exquifite a manner, and with fuch remarkable delicacy, that three or four of thefe fides laid upon one another, are not thicker than a leaf of common paper; and becaufe the entrance of the cell, which is adapted to the fize of the bee, would, on account of this delicacy, be fubject to break, they ftrengthen the entrance of each cell with a border of wax.

We have already obferved, that the bees which build the cells work but a little while at a time; but it is different with regard to thofe that polifh them, for they work a long while, and with great expedition, never intermitting their labour, unlefs it be to carry out of the cell the particles of wax taken off in polifhing: and, to prevent this wax from being loft, other bees ftand ready to receive it from the polifhers, and carry it to fome other part in order to its being employed.

Each comb has two rows of cells oppofite to each other, which have their common bafes. The thicknefs of each comb is fomething lefs than an inch; and, confequently, the depth of each cell about five lines; but at the fame time the breadth of each is little more than two.

All the combs are conftructed with cells of this fize, except a fmall number of others in fome particular parts of the hive, which are larger, and appropriated to the lodging eggs, that afterwards become drones, or male bees.

There are alfo, in fome parts of the hive, three or four cells bigger than the others, and conftructed in a different manner. They are of a fpheroidical figure, open in the inferior part, and attached to the extremeties of the combs.

When the cells are completed, the queen takes poffeffion of thofe fhe likes beft to depofite her eggs in, and the reft are left to be filled with honey. She lays one egg in each cell, and fometimes more than an hundred of thofe eggs in a day; but what is ftill more remarkable, fhe lays thofe eggs which are to produce common bees in cells of the common fhape and fize, thofe that are to become drones or males, in the cells of a larger fize, and depofites thofe which are to become females, like herfelf, in the fpheroidical cells already defcribed.

Thefe eggs, after lying fome time in the cells, are hatched into maggots, and fed with honey ten or twelve days, after which the other bees clofe up the cells with a thin piece of wax; and under this covering they become gradually transformed into bees, in the manner as filk-worms are into butterflies. Having undergone this change, the young bees pierce through their waxen doors, wipe off the humidity from their little wings, take their flight into the fields, rob the flowers of their fweets, and are perfectly acquainted with every neceffary circumftance of their future conduct. As to the males or drones, which are deftined only to propagate their fpecies, they live very comfortably for about three months after they are hatched; but when that time is over, and the females are impregnated, the common bees either kill them, or drive them from the hive, as burdenfome to the community, and not a drone is to be found till the next feafon.

The method in which the bees collect their wax and honey deferves to be a little explained. At the bottom of all flowers there are certain glands which contain more or lefs honey, that is, the moft exalted particles of the fugary juices of the plant. Thefe juices the bee fucks up with her probofcis or trunk above-mentioned, and draws it into her mouth; and when it has thus taken a fufficient quantity into her ftomach, returns to the hive, and difcharges the honey into the common magazine.

When the cells prepared to receive it are full, the bees clofe up fome with wax till they have occafion for the honey; the reft they leave open, to which all the members of the fociety refort, and take their repaft with a very inftructive moderation.

It is an excellent obfervation of a modern author, that the hive is a fchool to which numbers of people ought to be fent; prudence, induftry, benevolence, public fpiritednefs, œconomy, neatnefs, and temperance, are all vifible among the bees. Thefe little animals are actuated by a focial fpirit, which forms them into a body politic, intimately united, and perfectly happy. They all labour for the general advantage; they are all fubmiffive to the laws and regulations of the community: having no particular intereft, no diftinction but thofe which nature or the neceffities of their young have introduced amongft them. We never fee them diffatisfied with their condition, or inclinable to abandon the hive in difguft, or find themfelves flaves or neceffitous: on the contrary, they think themfelves in perfect freedom, and perfect affluence; and fuch indeed is their real condition. They are free, becaufe they only depend on the laws; they are happy, becaufe the concurrence of their feveral labours inevitably produces abundance, which contributes to the riches of each individual. Let us compare human focieties with this, and they will appear altogether monftrous. Neceffity, reafon, and philofophy, have eftablifhed them for the commendable purpofes of mutual aid and benefits: but a fpirit of felfifhnefs deftroys all; and one half of mankind, to load themfelves with fuperfluities, leave the other deftitute of common neceffaries.

Wax is compofed of the farina, or duft, formed on the apices of flowers. This the bees collect, and with their fore-feet and jaws, roll up into little balls, which they convey, one at a time, to the feet of their middle legs, and from thence to the middle joints of their hind legs, where there is a fmall cavity like a fpoon to receive it. Thefe balls are not, however, true wax, but the fubftance or bafis of it: to reduce this crude fubftance into wax, it muft firft be digefted in the body of the bee.

After the bees have brought home this crude fubftance, they eat it by degrees; or, at other times, three or four bees come and eafe the loaded bee by eating each of them a fhare, the loaded bee giving them a hint fo to do. Hunger is not the motive of their thus eating the balls of waxy matter, efpecially when a fwarm is firft hived; but it is their defire to provide a fpeedy fupply of real wax for making the combs. At other times, when

when there is no immediate want of wax, the bees lay this matter up in repositories, to keep it in store.

When this waxy matter is swallowed, it is, by the digestive powers of the bee, converted into real wax, which the bees again disgorge as they work it up into combs; for it is only while thus soft and pliant from the stomach that they can fabricate it properly. That the wax thus employed is taken from their stomachs, appears from their making a considerable quantity of comb soon after they are hived, and even on any tree or shrub where they have rested but a short while before their being hived, though no balls were visible on their legs, excepting those of a few which may be just returned from the field.

Bees collect crude wax also for food; for if this was not the case, there would be no want of wax after the combs are made: but they are observed, even in old hives, to return in great numbers loaded with such matter, which is deposited in particular cells, and is known by the name of *bee-bread*. We may guess that they consume a great deal of this substance in food, by the quantity collected, which, by computation, may in some hives amount to an hundred weight in a season, whilst the real wax in such an hive does not perhaps exceed two pounds.

But besides the three substances, honey, wax, and bee-bread, already mentioned, there is another with which the bees close every crevice in their hives, and which is called propolis. It is a kind of resin easy to be rolled out, much more tenacious than wax, and more easily fixed. It does not seem to require any preparation, being a real resin, which they collect from trees, and employ as they find it. It grows very hard in the hive, but may be softened by heat. It is dissoluble in spirit of wine. It commonly diffuses a very agreeable smell when heated. Its outward colour is of a reddish brown; its inside resembles wax, and is a little yellowish. When the bees make use of it, it is soft and pliable; but it hardens daily, and becomes in time harder than wax. This propolis serves also for another purpose, which is, that when a snail, slug, or any other creature too large to be carried out by the bees, has been slain in the hive, they case it over with this substance, and thereby prevent the bad effects of the putrid smell arising from dead bodies.

When the hive is become too much crowded, by the addition of the young brood, a part of the bees think of finding themselves a more commodious habitation, and with that view single out the most forward of the young queens. A new swarm is therefore constantly composed of one queen at least, and of several thousand working bees, as well as of some hundreds of drones. The working bees are some old, some young.

Scarce has the colony arrived at its new habitation, when the working bees labour with the utmost diligence, to procure materials for food and building. Their principal aim is not only to have cells in which they may deposit their honey; a stronger motive seems to animate them. They seem to know that their queen is in haste to lay her eggs. Their industry is such, that in twenty-four hours they will have made combs twenty inches long, and wide in proportion. They make more wax during the first fortnight, if the season is favourable, than they do during all the rest of the year. Other bees are at the same time busy in stopping all the holes and crevices they find in their new hive, in order to guard against the entrance of insects which covet their honey, their wax, or themselves; and also to exclude the cold air; for it is indispensably necessary that they be lodged warm.

When the bees first settle in swarming, indeed when they at any time rest themselves, there is something very particular in their method of taking their repose. It is done, by collecting themselves in a heap, and hanging to each other by their feet. They sometimes extend these heaps to a considerable length. It would seem probable to us, that the bees from which the others hang, must have a considerable weight suspended to them. All that can be said is, that the bees must find this to be a situation agreeable to themselves. They may perhaps have a method of distending themselves with air, thereby to lessen their specific gravity; in the same manner as fishes do, in order to alter their gravity, compared with water.

When a swarm divides into two or more bands, which settle separately, this division is a sure sign that there are two or more queens among them. One of these clusters is generally larger than the other. The bees of the smaller cluster, or clusters, detach themselves by little and little, till at last the whole, together with the queen, or queens, unite with the larger cluster. As soon as the bees are hived and settled, the supernumerary queen, or queens, must be sacrificed to the peace and tranquility of the hive. This execution generally raises a considerable commotion in the hive, and several other bees, as well as the queen or queens, lose their lives. Their bodies may be observed on the ground, near the hive. The queen that is chosen is of a more reddish colour than those which are destroyed: so that fruitfulness seems to be a great motive of preference in bees; for the nearer they are to the time of laying their eggs, the bigger, larger, and more shining are their bodies.

For three or four nights before a swarm sallies forth, there is in the hive a peculiar humming noise, of which authors give very different descriptions, probably owing to the strength of imagination in each. Every sound among bees arises from their striking their wings against the air: their wings being their sole organ of sound, if we may be allowed the expression. By moving their wings more or less forcibly and swiftly, they beat the air, and form the varied confused sounds which we call humming. The noise which foretels their swarming is easily distinguished by those who are accustomed to it, and is more especially observed before the casts, or second and following swarms. The hive appears so full of bees, that part of them hang in clusters on the outside; and the drones are perceived flying about in greater numbers than usual. But the most certain sign, and which indicates this event to be on that day, is, that the bees refrain from flying into the fields, though the season seems inviting. Just before they take their flight, there is an uncommon silence in the hive, and this continues for some time: but as soon as one breaks forth, they all follow, and are instantly on the wing. They seldom swarm before the sun has warmed the air; that is, not before ten in the morning, and seldom later than three in the afternoon: and the time of the year in which they most generally swarm, is from the middle of May to the end of June; but sometimes sooner or later, according as the season is more or less favourable. The earliest swarms do not always prove the best, especially if they are so early as the end of April or beginning of May: for the weather often is afterwards so wet and cold, that they are frequently in danger of being destroyed, or greatly reduced, by famine. Though swarms which issue forth so late as July are not in danger of a present famine; yet they scarcely have time and opportunity to lay in a sufficient store for the winter. Towards the season of swarming, the door of the hive should be enlarged, to give the bees the greater freedom to issue out; and it should likewise remain so for young swarms, during the first fortnight or three weeks, to allow the freer entrance to the bees, at that time extremely busy in collecting their necessary stores. The entrance should afterwards be gradually lessened, to prevent the otherwise easy access of enemies, of which there is great danger, especially as the autumn advances.

Hives continue sometimes to send forth swarms till the old hive becomes too much weakened, and part of it is empty. It is probable, that the prolific young queens prompt the bees to swarm thus frequently: for it is certain that if there is not a young mother qualified to bring forth a numerous progeny, though there be ever so great a number of bees, they will all remain, and die rather than quit the hive.

Whenever the bees of a swarm fly too high, they are made to descend lower, and disposed to settle, by throwing among them handfuls of sand or dust: probably the bees mistake this for rain. It is usual at the same time to beat on a kettle or frying-pan; perhaps from its being observed that the noise of thunder prompts such bees as are in the fields to return home. Precautions of this kind are the more neceſſary, if, as Dr. Warder, in his True Amazons, obſerves, "the bees always provide a place for their habitation before they ſwarm; either in ſome hollow tree, or in the hollow part of ſome old building, or in ſome deſerted hive, which the ſwarm have already prepared, by cleaning out whatever may be offenſive to their cleanly nature." Of this he gives an inſtance; and concludes, that "though they provide themſelveswith a houſe before they ſwarm, and take much pains about it; yet if you are early enough in your taking the ſwarm, and they find themſelves at unawares in a convenient houſe, they have no mind generally to leave it: but if they riſe again the ſame or next day, be ſure hive them not in the ſame hive again, for it is plain they have ſome diſlike to it."

As ſoon as the ſwarm is ſettled, the bees which compoſe it ſhould be got into a hive with all convenient ſpeed, to prevent their taking wing again. If they ſettle on a ſmall branch of a tree, eaſy to be come at, it may be cut off, and laid upon a cloth; the hive being ready immediately to put over them. If the branch cannot be conveniently cut, the bees may be ſwept from off it into a hive. Lodge but the queen in the hive, and the reſt will ſoon follow. If the bees muſt be conſiderably diſturbed, in order to get them into a hive, the moſt adviſable way is to let them remain in the place where they have pitched, till the evening, when there is leſs danger of their taking wing. If it be obſerved that they ſtill hover about the place they firſt alighted upon, the branches there may be rubbed with rue, or elder leaves, or any other thing diſtaſteful to them, to prevent their returning to it.

The hive employed on this occaſion ſhould be cleaned with the utmoſt care, and its inſide be rubbed very hard with a coarſe cloth, to get off the looſe ſtraws, or other impurities, which might coſt them a great deal of time and labour to gnaw away. It may then be rubbed with fragrant herbs or flowers, the ſmell of which is agreeable to the bees, or with honey.

The hive ſhould not be immediately ſet on the ſtool where it is to remain, but ſhould be kept near the place at which the bees ſettled, till the evening, leſt ſome ſtragglers ſhould be loſt. It ſhould be ſhaded, either with boughs, or with a cloth, that the too great heat of the ſun may not annoy the bees.

We ſometimes ſee a ſwarm of bees, after having left their hive, and even alighted upon a tree, return to their firſt abode. This never happens but when the young queen did not come forth with them, for want of ſtrength, or perhaps courage to truſt to her wings for the firſt time; or poſſibly from a conſciouſneſs of her not being impregnated.

Bees are not apt to ſting when they ſwarm; therefore it is not neceſſary then to take much extraordinary precaution againſt them. It is however adviſable for thoſe who are not accuſtomed to them, to cover their face and hands.

A ſecond ſwarm ſcarcely is, and much leſs are the ſubſequent ones, worth keeping ſingle; becauſe, being few in number, they cannot allow ſo large a proportion of working bees to go abroad in ſearch of ſtore, as more numerous ſwarms can, after having appointed a proper number for the various works to be done within. For this reaſon it is adviſable to unite two or more of theſe laſt or latter ſwarms into one hive, ſo as to procure a ſufficient number of bees in one hive. Bees ſometimes ſwarm ſo often, that the mother-hive is too much weakened. In this caſe, the ſwarms ſhould be reſtored back; and this ſhould alſo be done when a ſwarm produces a ſwarm the firſt ſummer, as it ſometimes does. The beſt way, indeed, is to prevent ſuch ſwarming, by giving the bees more room: though this, again, will not anſwer where there is a young pregnant queen; ſhe well knowing that her life is the forfeit of her remaining at home.

The uſual method of uniting ſwarms is very eaſy. Spread a cloth at night upon the ground cloſe to the hive in which the two caſts or ſwarms are to be united; lay a ſtick a-croſs this cloth; then fetch the hive with the new ſwarm, ſet it over the ſtick, give a ſmart ſtroke on the top of the hive, and all the bees will drop down upon the cloth, in a cluſter. This done, throw aſide the empty hive, take the other from off the ſtool, and ſet this laſt over the bees, who will ſoon aſcend into it, mix with thoſe already there, and become one and the ſame family. Others, inſtead of ſtriking the bees down upon the cloth, place with its bottom upmoſt the hive in which the united ſwarms are to live, and ſtrike the bees of the other hive down into it. The former of theſe hives is then reſtored to its natural ſituation, and the bees of both hives ſoon unite. If ſome bees ſtill adhere to the other hive, they may be bruſhed off on the cloth, and they will ſoon join their brethren. Or one may take the following method, which gives leſs diſturbance to the bees. Set with its mouth upmoſt the hive into which the young ſwarm has been put, and ſet upon it the other hive. The bees in the lower hive, finding themſelves in an inverted ſituation, will ſoon aſcend into the upper.

Though all writers acknowledge, that one of the queens is conſtantly ſlain on theſe occaſions, and generally a conſiderable number of the working bees; yet none of them, Columella excepted, has propoſed the eaſy remedy of killing the queen of the latter caſt or ſwarm before the union is made; a means by which the lives of the working bees may be preſerved. This may be done, either by intoxicating them, and then picking her out, or by ſearching her out when the bees are beaten down upon the cloth; for this being done in the night, to prevent the battle which might otherwiſe enſue, there will be no great difficulty in finding her.

A large ſwarm may weigh eight pounds, and ſo gradually leſs, to one pound: conſequently a very good one may weigh five or ſix pounds. All ſuch as weigh leſs than four pounds ſhould be ſtrengthened, by uniting to each of them a leſs numerous ſwarm. The ſize of the hive ſhould be proportioned to the number of the bees; and, as a general rule, it ſhould be rather under than over-ſized, becauſe bees require to be kept warmer than a large hive will admit of.

Columella directs, that the apiary, or bee-garden, face the ſouth, in a place neither too hot, nor too much expoſed to the cold; that it be in a valley, in order that the loaded bees may with the greater eaſe deſcend to their homes; that it be near the manſion-houſe, on account of the conveniency of watching them, but ſo ſituated as not to be expoſed to noiſome ſmells, or to the din of men or cattle; that it may be ſurrounded with a wall, which however ſhould not riſe above three feet high; that, if poſſible, a running ſtream be near them, or, if that cannot be, that water be brought near them in troughs, with pebbles or ſmall ſtones in the water, for the bees to reſt on whilſt they drink; or that the water be confined within gently declining banks, in order that the bees may have ſafe acceſs to it; they not being able to produce either combs, honey, or food for their maggots, without water. That the neighbourhood of rivers or baſons of water with high banks be avoided, becauſe winds may whirl the bees into them, and they cannot eaſily get on ſhore from thence to dry themſelves; and that the garden in which the apiary ſtands be well furniſhed with ſuch plants as afford the bees plenty of good paſture. The trees in this garden ſhould be of the dwarf kind, and their heads buſhy, in order that the ſwarms which ſettle on them may be the more eaſily hived.

The proprietor ſhould be particularly attentive that the bees have alſo in their neighbourhood ſuch plants as yield them plenty of food. Columella enumerates many of theſe fitted to a warm climate: among them he mentions thyme, the oak, the pine, the ſweet ſmelling cedar, and all fruit trees. Experience has taught us, that furze, broom, muſtard, clover, heath, buck-wheat, &c. are excellent for this purpoſe. Pliny recommends broom, in particular, as a plant exceedingly grateful, and very profitable to bees; and Mr. Bradley ſpeaks highly of the advantages which ariſe from the planting of it for the food of theſe uſeful inſects. *See the article* BROOM.

Plantations of muſtard, of the flowers of which bees are extremely fond, may be kept in bloom for ſeveral weeks running.

Great improvements may alfo certainly be made in the effential article of providing plenty of pafture for bees, whenever this fubject fhall be more carefully attended to than it, unfortunately, has hitherto been. A rich corn country is well known to be a barren defart to them during the moft confiderable part of the year; and therefore the practice of other nations, in fhifting the places of abode of their bees, well deferves our imitation.

Columella informs us, that, as few places are fo happily fituated as to afford the bees proper pafture both in the beginning of the feafon and alfo in the autumn, it was the advice of Celcus, that after the vernal paftures are confumed, the bees fhould be tranfported to places abounding with autumnal flowers; as was practifed by conveying the bees from Achaia to Attica, from Eubœa and the Cyclad iflands to Scyrus, and alfo in Sicily, where they were brought to Hybla from other parts of the ifland. He likewife directs, that the hives be carefully examined before they are removed from one place to another, and to take out fuch combs as appear old, loofe, or have moths in them, referving only thofe that are found, in order that the hive may be ftored with combs collected from the beft flowers.

M. Maillet, in his curious defcription of Egypt, relates, that "fpite of the ignorance and rufticity which have got poffeffion of that country, there yet remain in it feveral footfteps of the induftry and fkill of the antient Egyptians. One of their moft admirable contrivances is, their fending their bees annually into diftant countries, in order to procure them fuftenance there, at a time when they could not find any at home; and their afterwards bringing them back, like fhepherds who fhould travel with their flocks, and make them feed as they go. It was obferved by the antient inhabitants of Lower Egypt, that all plants bloffomed, and the fruits of the earth ripened, above fix weeks earlier in Upper Egypt, than with them. They applied this remark to their bees; and the means then made ufe of by them, to enable thefe ufeful induftrious infects to reap advantage from the more forward ftate of nature there, were exactly the fame as are now practifed, for the like purpofe, in that country. About the end of October, all fuch inhabitants of the Lower Egypt as have hives of bees, embark them on the Nile, and convey them upon that river quite into Upper Egypt; obferving to time it fo that they arrive there juft when the inundation is withdrawn, the lands have been fown, and the flowers begin to bud. The hives thus fent are marked and numbered by their refpective owners, and placed pyramidically in boats prepared for the purpofe. After they have remained fome days at their fartheft ftation, and are fuppofed to have gathered all the wax and honey they could find in the fields within two or three leagues around; their conductors convey them, in the fame boats, two or three leagues lower down, and there leave the laborious infects fo long time as is neceffary for them to collect all the riches of this fpot. Thus, the nearer they come to the place of their more permanent abode, they find the productions of the earth, and the plants which afford them food, forward in proportion. In fine, about the beginning of February, after having travelled through the whole length of Egypt, gathering all the rich produce of the delightful banks of the Nile, they arrive at the mouth of that river, towards the ocean; from whence they fet out, and from whence they are now returned to their feveral homes: for care is taken to keep an exact regifter of every diftrict from whence the hives were fent in the beginning of the feafon, of their numbers, of the names of the perfons who fent them, and likewife of the mark or number of the boat in which they were placed."

The author of the Natural Hiftory of Bees gives the following account of what is practifed in this way in France; an example well worth our imitation in many parts of this kingdom. "M. Proutaut, fays he, keeps a great number of hives. His fituation is one of thofe in which flowers become rare or fcarce very foon, and where few or none are feen after the corn is ripened. He then fends his bees into Beauce, or the Gatinois, in cafe it has rained in thofe parts. This is a journey of about twenty miles, which he makes them take. But if he concludes that the bees could not meet, in either of thofe counties, wherewith to employ themfelves advantageoufly, he then has them carried into Sologne, about the beginning of Auguft; as knowing that they will there meet with a great many fields of buck-wheat in flower, which will continue fo till about the end of September. His method of tranfporting them is thus. His firft care is, to examine thofe hives, fome of whofe honey-combs might be broken or feparated by the jolting of the vehicle: they are made faft one to the other, and againft the fides of the hive, by means of fmall fticks, which may be difpofed differently as occafion will point out. This being done, every hive is fet upon a packing-cloth, or fomething like it, the threads of which are very wide: the fides of this cloth are then turned up, and laid on the outfide of each hive, in which ftate they are tied together with a piece of fmall pack-thread wound feveral times round the hive. As many hives as a cart built for that purpofe will hold, are afterwards placed in this vehicle. The hives are fet two and two, the whole length of the cart. Over thefe are placed others; which make, as it were, a fecond ftory or bed of hives. Thofe which are ftored with combs fhould always be turned topfy-turvy. It is for the fake of their combs, and to fix them the better, that they are difpofed in this manner; for fuch as have but a fmall quantity of combs in them, are placed in their natural fituation. Care is taken in this ftowage, not to let one hive ftop up another; it being effentially neceffary for the bees to have air; and it is for this reafon they are wrapped up in a coarfe cloth, the threads of which were wove very wide, in order that the air may have a free paffage, and leffen the heat which thefe infects raife in their hives; efpecially when they move about very tumultuoufly, as often happens in thefe carts. Thofe ufed for this purpofe in Yévre, hold from thirty to forty-eight hives. As foon as all are thus ftowed, the caravans fet out. If the feafon is fultry, they travel only in the night; but a proper advantage is made of cool days. You will imagine that they do not ride poft. The horfes muft not be permitted even to trot; they are led flowly, and through the fmootheft roads. When there are not combs in the hives fufficient to fupport the bees during their journey, the owner takes the earlieft opportunity of refting them wherever they can collect wax. The hives are taken out of the cart, then fet upon the ground, and after removing the cloth from over them, the bees go forth in fearch of food. The firft field they come to ferves them as an inn. In the evening, as foon as they are all returned, the hives are fhut up; and being placed again in the cart, they proceed in their journey. When the caravan is arrived at the journey's end, the hives are diftributed in the gardens; or in fields adjacent to the houfes of different peafants, who, for a very fmall reward, undertake to look after them. Thus it is that, in fuch fpots as do not abound in flowers at all feafons, means are found to fupply the bees with food during the whole year."

Thefe inftances of the great advantages which attend fhifting of bees in fearch of pafture, afford an excellent leffon to many places in this kingdom: they direct particularly the inhabitants of the rich vales, where the harveft for bees ends early, to remove their flocks to places which abound in heath, this plant continuing in bloom during a confiderable part of the autumn, and yielding great plenty of food to bees. Thofe in the neighbourhood of hills and mountains will fave the bees a great deal of labour, by taking alfo the advantage of fhifting their places of abode.

We come now to explain the moft inhuman method commonly practifed of taking bees, which confifts in wantonly deftroying the whole fwarm, in order to enjoy the fruits of their labours.

Were we to kill the hen for her egg, the cow for her milk, or the fheep for the fleece it bears, every one would inftantly fee how much we fhould act contrary to our own intereft: and yet this is practifed every year in regard to bees. Would it not argue more wifdom in us to be contented with taking away only a portion of their wax and honey, as is the practice of many countries?

The

The common method here is, that when thofe which are doomed for flaughter have been marked out (which is generally done in September) a hole is dug near the hive, and a ftick, at the end of which is a rag that has been dipped in melted brimftone, being ftuck in that hole, the rag is fet on fire, the hive is immediately fet over it, and the earth is inftantly thrown up all around, fo that none of the fmoak can efcape. In a quarter of an hour, all the bees are feemingly dead; and they will foon after be irrecoverably fo, by being buried in the earth that is returned back into the hole: I fay, they will foon be abfolutely killed by this laft means; becaufe it has been found, by experiment, that all the bees which have been affected only by the fume of the brimftone, recover again, excepting fuch as have been finged or hurt by the flame. Hence it is evident, that the fume of brimftone might be ufed for intoxicating the bees, with fome few precautions. The heavieft and the lighteft hives are alike treated in this manner; the former, becaufe they yield the moft profit, with an immediate return; and the latter, becaufe they would not be able to furvive the winter. Thofe hives which weigh from fifteen to twenty pounds, are thought to be the fitteft for keeping.

The practice of the ancients was, however, very different from this: they were content to fhare with thefe induftrious infects, the produce of their labours; and fome very laudable attempts have been made in our own country, to attain the defirable end of getting the honey and wax without deftroying the bees. John Geddy, Efq; publifhed in the year 1665, his invention of boxes for preferving the lives of bees. Thefe were improved by Jofeph Warder, phyfician, at Croydon, who at the fame time embellifhed his account of the ftructure and ufe of thefe boxes, with feveral other curious circumftances concerning bees, in his work intituled, The true Amazons, or the Monarchy of Bees. Two very worthy clergymen, the reverend Mr. John Thorley of Oxford, and the reverend Mr. Stephen White, M. A. rector of Holton in Suffolk, have brought the method of preferving the lives of bees to ftill greater perfection. We fhall relate the opinions and practice of each, beginning with Mr. Thorley, who lived many years before Mr. White, and add to their accounts the beft improvements that have been lately made in foreign countries.

Mr. Thorley, in his Enquiry into the Nature, Order, and Government of Bees, thinks colonies preferable to hives, for the following reafons. Firft, the more certain prefervation of very many thoufands of thefe noble and ufeful creatures: Secondly, their greater ftrength (which confifts in numbers) and confequently their greater fafety from robbers: Thirdly, their greater wealth, arifing from the united labours of the greater number. He tells us, that he has in fome fummers taken two boxes filled with honey from one colony; and yet fufficient ftore has been left for their maintenance during the winter, each box weighing forty pounds. Add to thefe advantages, the pleafures of viewing them; with the greateft fafety, at all feafons, even in their bufieft time of gathering, and their requiring a much lefs attendance in fwarming time. The bees thus managed are alfo more effectually fecured from wet and cold, from mice and other vermin.

His boxes are made of deal, which, being fpungy, fucks up the breath of the bees fooner than a more folid wood would do. Yellow dram-deal, thoroughly feafoned, is the beft.

An octagon, being nearer to a fphere, is better than a fquare form; for as the bees, in winter, lie in a round body near the center of the hive, a due heat is then conveyed to all the out-parts, and the honey is kept from candying.

The dimenfions which Mr. Thorley, after many years experience, recommends for the boxes, are ten inches deep, and twelve or fourteen inches broad, in the infide. He has tried boxes containing a bufhel or more, but found them not to anfwer the defign like thofe of a leffer fize.

The top of the box fhould be made of an entire board, a full inch thick after it has been planed, and it fhould project on all fides at leaft an inch beyond the dimenfions of the box. In the middle of this top there muft be a hole five inches fquare, for a communication between the boxes; and this hole fhould be covered with a fliding fhutter, of deal or elm, running eafily in a groove over the back window. The eight pannels, nine inches deep, and three quarters of an inch thick when planed, are to be let into the top fo far as to keep them in their proper places; to be fecured at the corners with plates of brafs, and to be cramped with wires at the bottom, to keep them firm: for the heat in fummer will try their ftrength. There fhould be a glafs window behind, fixed in a frame, with a thin deal cover, two fmall brafs hinges, and a button to faften it. This window will be fufficient for infpecting the progrefs of the bees. Two brafs handles, one on each fide, are neceffary, to lift up the box: thefe fhould be fixed in with two thin plates of iron, near three inches long, fo as to turn up and down, and put three inches below the top-board, which is nailed clofe down with fprigs to the other parts of the box.

Thofe who chufe a frame within, to which the bees may faften their combs, need only ufe a couple of deal fticks of an inch fquare, placed acrofs the box, and fupported by two pins of brafs; one an inch and a half below the top, and the other two inches below it; by which means the combs will quickly find a reft. One thing more, which perfects the work, is a paffage four or five inches long, and lefs than half an inch deep, for the bees to go in and out at the bottom of the box.

Mr. Thorley, fon to the above-mentioned clergyman, has improved his father's method of managing bees; and having been convinced from near fixty years experience, that his bee-hives would be productive of much greater profit to the owners of bees, and alfo render that cruel and ungenerous practice of deftroying thefe animals not only unneceffary, but pernicious, prefented a bee-hive of this conftruction to the Society of Arts, &c. in the Strand, who readily purchafed another of his hives filled with honey, &c. that they might be infpected by the curious, and brought into univerfal ufe; and from this bee-hive the view on Plate III. Fig. 8, was drawn. The fociety, perfuaded that the invention would prove of the greateft advantage to this country, publifhed a premium of two hundred pounds, in order to introduce Mr. Thorley's, or fome other method of a fimilar kind, whereby much larger quantities of honey and wax might be procured, and, at the fame time, the lives of thefe laborious and ufeful infects preferved.

The bottom part, marked *a*, is an octangular bee-box, made of deal boards, about an inch in thicknefs, the cover of which is about 17 inches in diameter, but the internal part only 15½, and its height 10 inches. In the middle of the cover of this octangular box is a hole, which may be opened or fhut at pleafure, by means of a flider *d*. In one of the pannels is a pane of glafs, covered with a wooden door, *e*. The entrance, *f*, at the bottom of the box is about three inches and a half broad, and half an inch high. Two flips of deal, about half an inch fquare, crofs each other in the center of the box, and are faftened to the pannels by means of fmalls fcrews. To thefe flips the bees faften their combs.

In this octangular box the bees are hived, after fwarming in the ufual manner, and there fuffered to continue till they have built their combs, and filled them with honey, which may be known from opening the door, and viewing their works through the glafs pane, or by the weight of the hive. When the bee-mafter finds his laborious infects have filled their habitation, he is to place a common bee-hive of ftraw, reprefented at *b*, made either flat at the top, or in the common form, on the octangular box, and draw out the flider, by which a communication will be opened between the box and the ftraw hive; the confequence of which will be, that thofe laborious infects will fill this hive alfo with the product of their labours. When the bee-mafter finds the ftraw hive is well filled, he may pufh in the flider, and take it away, placing another immediately in its room, and then drawing out the flider. Thefe indefatigable creatures will then fill the new hive in the fame manner.

manner. By proceeding in this method, Mr. Thorley assured the society that he had taken three successive hives, filled with honey and wax, from one single hive, during the same summer; and that after he had laid his insects under so large a contribution, the food still remaining in the octangular box was abundantly sufficient for their support during the winter. He added, that if this method was pursued in every part of the kingdom, instead of that cruel method of putting the creatures to death, he was persuaded, from long experience, that wax would be collected in such plenty that candles might be made with it, and sold as cheap as those of tallow are at present.

Mr. Thorley has also added another part to his bee-hive, which cannot fail of affording the highest entertainment to a curious and inquisitive mind. It consists of a glass receiver, represented at D, eighteen inches in height, eight inches in diameter at the bottom, and in the greatest part thirteen. This receiver has a hole at the top, about an inch in diameter, through which a square piece of deal E is extended to nearly the bottom of the vessel, having two cross bars to which the bees fasten their combs. When the bees have filled their straw hive, (which must have a hole in the center, covered with a piece of tin) Mr. Thorley places the glass *e* upon the top of the straw hive, and draws out the piece of tin: the bees, now finding their habitation enlarged, pursue their labours with such alacrity, that they fill this glass hive likewise with their stores. And as this receptacle is wholly transparent, the curious observer may entertain himself with viewing the whole progress of their works. One of the hives, now deposited at the society's rooms in the Strand, is filled with the produce of the labours of those insects; and the glass-hive is supposed to contain about thirty-eight pounds of honey.

It will, however, be necessary to cover the glass with an empty hive of straw, or at least with a cloth, which may be easily removed when you inspect your bees, lest too much light prevent your insects from working.

When the glass is completely filled, slide a tin-plate between it and the hive or box, so as to cover the passage, and in half an hour the glass may be taken off with safety. What few bees remain in it, will readily go to their companions. He then very obligingly offers his service and farther information to any gentleman or lady whose curiosity may incline them to inspect his apiary. He has added a glass window to his straw hives, in order to see what progress the bees make; which is of some importance, especially if one hive is to be taken away whilst the season still continues favourable for their collecting of honey: for when the combs are filled with honey, the cells are sealed up, and the bees forsake them, and reside mostly in the hive in which their works are chiefly carried on. Observing also, that the bees were apt to extend their combs through the passage of communication into the upper hive, whether glass or other, which rendered it necessary to divide the comb when the upper hive was taken away, he now puts in that passage a wire screen, or netting, the meshes of which are large enough for a loaded bee to go easily thro' them. This prevents the joining of the combs from one box to the other, and consequently obviates the necessity of cutting them, and of spilling some honey, which, running down amongst a crowd of bees, used before to incommode them much; it being difficult for them to clear their wings of it.

The reverend Mr. Stephen White, rector of Holton in Suffolk, informs us, that his fondness for these little animals soon put him upon endeavouring, if possible, to save them from *fire* and *brimstone*; that he thought he had reason to be content to share their labours for the present, and great reason to rejoice if he could at any time preserve their lives, to work for him another year; and that the main drift of his observations and experiments has therefore been, to discover an easy and cheap method, suited to the abilities of the common people, of taking away so much honey as can be spared, without destroying or starving the bees; and by the same means to encourage seasonable swarms.

In his directions how to make the bee-boxes of his inventing, he tells us, speaking of the manner of constructing a single one, that it may be made of deal or any other well seasoned boards which are not apt to warp or split. The boards should be near an inch thick: the figure of the box square, and its height and breadth nine inches and five eighths, every way measuring within. With these dimensions it will contain near a peck and an half. The front part must have a door cut in the middle of the bottom edge, three inches wide, and near half an inch in height, which will give free liberty to the bees to pass through, yet not be large enough for their enemy the mouse to enter. In the back part you must cut a hole with a rabbit in it, in which you are to fix a pane of the clearest and best crown-glass, about five inches in length, and three in breadth, and fasten it with putty: let the top of the glass be placed as high as the roof within-side, that you may see the upper part of the combs, where the bees with their riches are mostly placed. You will, by this means, be better able to judge of their state and strength, than if your glass was fixed in the middle. The glass must be covered with a thin piece of board, by way of shutter, which may be made to hang by a string, or turn upon a nail, or slide sideways between two mouldings. Such as are desirous of seeing more of the bees works, may make the glass as large as the box will admit, without weakening it too much; or they may add a pane of glass on the top, which must likewise be covered with a shutter, fastened down with pegs to prevent accidents.

The side of the box which is to be joined to another box of the same form and dimensions, as it will not be exposed to the external air, may be made of a piece of slit deal not half an inch thick. This he calls the side of communication, because it is not to be wholly inclosed: a space is to be left at the bottom the whole breadth of the box, and a little more than an inch in height, and a hole or passage is to be made at top, three inches long, and more than half an inch wide. Through these the bees are to have a communication from one box to the other. The lower communication being on the floor, our labourers, with their burthens, may readily and easily ascend into either of the boxes. The upper communication is only intended as a passage between the boxes, resembling the little holes, or narrow passes, which may be observed in the combs formed by our sagacious architects, to save time and shorten the way when they have occasion to pass from one comb to another; just as, in populous cities, there are narrow lanes and alleys, passing transversly from one large street to another.

In the next place you are to provide a loose board, half an inch thick, and large enough to cover the side where you have made the communication. You are likewise to have in readiness several little iron staples, an inch and half long, with the two points or ends bended down more than half an inch. The use of these will be seen presently.

You have now only to fix two sticks crossing the box from side to side, and crossing each other, to be a stay to the combs; one about three inches from the bottom, the other the same distance from the top; and when you have painted the whole, to make it more durable, your box is finished.

The judicious bee-master will here observe, that the form of the box now described is as plain as is possible for it to be. It is little more than five square pieces of board nailed together; so that a poor cottager, who has but ingenuity enough to saw a board into the given dimensions, and to drive a nail, may make his own boxes well enough, without the help or expence of a carpenter.

No directions are necessary for making the other box, which must be of the same form and dimensions. The two boxes differ from each other only in this, that the side of communication of the one must be on your right-hand; of the other on your left. Plate III. Fig. 9. represents two of these boxes, with their openings of communication, ready to join to each other.

Mr. White's manner of hiving a swarm into one or both of these boxes, is thus.

You are to take the loose board, and fasten it to one of the boxes, so as to stop the communications. This may be done by three of the staples before mentioned; one on the top of the box near the front, the two others on the back, near the top and near the bottom. Let one end of the staple be thrust into a gimlet-hole made in the box, so that the other end may go as tight as can be over the loose board, to keep it from slipping when it is handled. The next morning, after the bees have been hived in this box, the other box should be added, and the loose board should be taken away. This will prevent a great deal of labour to the bees, and some to the proprietor.

Be careful to fasten the shutter so close to the glass, that no light may enter through it; for the bees seem to look upon such light, as a hole or breach in their house, and on that account may not so well like their new habitation. But the principal thing to be observed at this time, is to cover the box, as soon as the bees are hived, with a linnen cloth thrown loosely over it, or with green boughs, to protect it from the piercing heat of the sun. Boxes will admit the heat much sooner than straw hives; and if the bees find their house too hot for them, they will be wise enough to leave it. If the swarm be larger than usual, instead of fastening the loose board to one box, you may join two boxes together with three staples, leaving the communication open from one to the other, and then hive your bees into both. In all other respects, they are to be hived in boxes after the same manner as in common hives; which being well known, it were needless here to give particular directions concerning it.

The door of the second box should be carefully stopped up, and be kept constantly closed, in order that the bees may not have any entrance but through the first box.

When the boxes are set in the places where they are to remain, they must be screened from the summer's sun, because the wood will otherwise be heated to a greater degree than either the bees or their works can bear; and they should likewise be screened from the winter's sun, because the warmth of this will draw the bees from that lethargic state which is natural to them, as well as to many other insects, in the winter season. For this purpose, and also to shelter the boxes from rain, our ingenious clergyman has contrived the following frame.

Plate III. Fig. 10. represents the front of a frame for twelve colonies. *a*, *a*, are two cells of oak, lying flat on the ground, more than four feet long. In these cells you are to fix four oaken posts, about the thickness of such as are used for drying linnen.

The two posts *b*, *b*, in the front, are about six feet two inches above the cells: the other two standing backward, five feet eight inches.

You are next to nail some boards of slit deal horizontally from one of the fore-posts to the other, to screen the bees from the sun. Let these boards be seven feet seven inches in length, and nailed to the inside of the posts, and be well seasoned, that they may not shrink or gape in the joints.

c, *c*, are two splines of deal, to keep the boards even, and strengthen them.

Plate III. Fig. 11. represents the back of the frame. *d*, *d*, *d*, *d*, are four strong boards of the same length with the frame, on which you are to place the boxes. Let the upper side of them be very smooth and even, that the boxes may stand true upon them: or it may be still more advisable, to place under every pair of boxes a smooth thin board, as long as the boxes, and about a quarter of an inch wider. The bees will soon fasten the boxes to this board, in such manner, that you may move or weigh the boxes and board together, without breaking the wax or resin, which for many reasons ought to be avoided. These floors must be supported by pieces of wood, or bearers *e*, *e*, &c. which are nailed from post to post at each end. They are likewise to be well nailed to the frame, to keep them from sinking with the weight of the boxes.

f represents the roof, which projects backward about seven or eight inches beyond the boxes, to shelter them from rain.

You have now only to cut niches or holes in the frame, over against each mouth or entrance into the boxes, at *b*, *b*, *b*, in Fig. 10. Let these niches be near four inches long; and under each you must nail a small piece of wood for the bees to alight upon.

The morning or evening sun will shine upon one or both ends of the frame, let its aspect be what it will: but you may prevent its over-heating the boxes, by a loose board set up between the posts, and kept in by two or three pegs.

The same gentleman, with great humanity, observes, that no true lover of bees ever lighted the fatal match without concern; and that it is evidently more to our advantage, to spare the lives of our bees, and be content with part of their stores, than to kill and take possession of the whole.

About the latter end of August, says he, by a little inspection through your glasses, you may easily discover which of your colonies you may lay under contribution. Such as have filled a box and a half with their works, will pretty readily yield you the half box. But you are not to depend upon the quantity of combs, without examining how they are stored with honey. The bees should, according to him, have eight or nine pounds left them, by way of wages for their summer's work.

The most proper time for this business is the middle of the day: and as you stand behind the frame, you will need no armour, except a pair of gloves. The operation itself is very simple, and easily performed, thus: open the mouth of the box you intend to take; then, with a thin knife, cut through the resin with which the bees have joined the boxes to each other, till you find that you have separated them; and after this thrust a sheet of tin gently in between the boxes. The communication being hereby stopped, the bees in the fullest box, where it most likely the queen is, will be a little disturbed at the operation; but those in the other box, where we suppose the queen is not, will run to and fro in the utmost hurry and confusion, and send forth a mournful cry, easily distinguished from their other notes. They will issue out at the newly opened door; not in a body, as when they swarm, nor with such calm and chearful activity as when they go forth to their labours; but by one or two at a time, with a wild flutter, and visible rage and disorder. This, however, is soon over; for as soon as they get abroad, and spy their fellows, they fly to them instantly, and join them at the mouth of the other box. By this means, in an hour or two, for they go out slowly, you will have a box of pure honey, without a living bee in it to molest you; and likewise without dead bees, which, when you burn them, are often mixed with your honey, and both waste and damage it.

Mr. White acknowledges, that he has sometimes found this method fail, when the mouth of the box to be taken away has not been constantly and carefully closed; the bees will, in this case, get acquainted with it as an entrance, and when you open the mouth in order to their leaving this box, many of them will be apt to return, and, the communication being stopped, will, in a short time, carry away all the honey from this to the other box; so much do they abhor a separation. When this happens, he has recourse to the following expedient, which he thinks infallible. He takes a piece of deal, a little larger than will cover the mouth of the box, and cuts in it a square nich somewhat more than half an inch wide. In this nich he hangs a little trap door, made of a thin piece of tin, turning upon a pin, with another pin crossing the nich a little lower, so as to prevent the hanging door from opening both ways. This being placed close to the mouth, the bees which want to get out will easily thrust open the door outwards, but cannot open it the other way, to get in again; so must, and will readily, make to the other box, leaving this in about the space of two hours, with all its store, justly due to the tender hearted bee-master, as a ransom for their lives.

What lead Mr. White to prefer collateral boxes to those before in use, was, to use his own words, his "compassion for the poor bees, who, after traversing the fields, return home weary and heavy laden, and must perhaps deposit their burden up two pair of stairs, or in the garret. The lower room, it is likely, is not yet furnished with stairs; for, as is well known, our little architects lay the foundation of their structures at the top, and build down-

downward. In this case, the weary little labourer is to drag her load up the sides of the walls; and when she has done this, she will travel, many times, backward and forward, as I have frequently seen, along the roof, before she finds the door, or passage into the second story; and here again she is perplexed with a like puzzling labyrinth, before she gets into the third. What a waste is here of that precious time which our bees value so much, and which they employ so well? and what an expence of strength and spirits, on which their support and sustenance depends? In the collateral boxes, the rooms are all on the ground floor: and because I know my bees are wise enough to value convenience more than state, I have made them of such a moderate, though decent, height, that the bees have much less way to climb to the top of them, than they have to the crown of a common hive."

Mr. White is confident that the expence of his boxes, and of the frame above described, will not, if a reasonable allowance be made for their duration, prove greater, in the end, than the charge of straw hives, and of the frames that are made, in most places, for their reception: to which he adds, that a great part of this expence may be saved, if the bee-master can spare a place within any of his buildings, especially if they be boarded, where he may fix his stools for the boxes to stand on, making holes at proper distances for the bees to work out at: nor need he be very solicitous concerning the aspect or height of his buildings; for bees have been known to thrive well, and get a large quantity of honey, though placed almost at the top of a high turret in Trinity-college, and on the north side of it.

M. Vicat, a very ingenious lady in Swisserland, published, in the memoirs of the Berne society for the year 1764, very judicious observations on bees and hives, particularly those which are added one to another in the manner above described. Her remarks well deserve our attention; and therefore we shall give here her own account of them.

On the ninth of June 1761, this lady bought an hive of bees, in a straw hive. The combs were emptied of their honey, and thereby rendered the more liable to be attacked by the moth. She placed it in a little garden in the heart of the city of Lausanne. She soon discovered there were moths in it, and that the bees had lice on them; which determined her to place a glass hive over the straw one, and to shut up the opening into the lower hive. She frequently looked into the glass hive, to see what passed in it. The bees never stopped in it, and it served only as a thoroughfare to the straw hive. The bees, though very laborious and numerous, could not defend themselves against the moths, which multiplied daily: on the eighteenth of July her bees were reduced to little more than three hundred. Finding their number decrease every day, she suspected that some accident had happened to the queen, which upon examination she found to be true; as she also did, that these moths may soon destroy the most numerous hive. They had mouldered away the wax, and had united the three middle combs, by their galleries, to such a degree, that they appeared but as one mass. Upon turning up the hive, to see what condition it was in, she found the sides covered with white and hard cocoons, which would soon produce moths. They were in such quantity as to fill the crown of her hat.

It appears to her that the moths are most ready to attack hives which have swarmed oftener than once; because in them the combs, in which the young bees were reared, being empty, serve for both shelter and food to their maggots, which feed only on wax. For the same reason, late swarms, and hives in which there is not much honey, are equally exposed to these insects. Such hives should therefore be cleaned at least once a week. If moths are found on the stool of the hive, it should be cleaned every morning. In order to do this the more easily, without disturbing the bees, or running the hazard of being stung by them, she caused a large square hole to be made in the stools on which her bees stand, with a slider underneath, fitted to it. By this means she preserved another hive, which she had placed in the same garden on the same day, June nine, 1761: and though it was a swarm put into a new straw hive, she observed moths in it by the end of July. She calls this hive Numb. 1.

When she secured this hive for the winter, she put it into a dry room; but the air there being too mild, the bees consumed almost their whole store. She drew the slider often; for the disaster which had happened to her other hive rendered her now more attentive, and she generally found a quantity of moths on it. The combs became mouldy, which she endeavoured to wipe off with soft brown paper, and rubbed it off the sides of the hive with a napkin. So many bees died during the winter, that the hive became very weak in comparison to what it was in the autumn. About the middle of March, she placed it in a little garden surrounded with houses.

She placed near the former a swarm of June 1761, which had been kept in a hive of Mr. Paltau's construction, and had stood the preceding summer in the country, and the winter in a green-house in town, where the air was constantly kept temperate. Few of these bees died. She calls this hive Numb. 2.

That she might judge of the strength of these hives, she counted the bees which entered into each of them in a quarter of an hour, taking the same hour of a fine day. She repeated this during several weeks, and found that about six hundred and sixty entered in Numb. 2, and two hundred, or sometimes two hundred and twenty, in the same time, into Numb. 1.

In May, the numbers of bees were so much increased, that it was no longer possible to count them. Numb. 1. was now as well stocked with bees as Numb. 2. She had been particularly careful of the former, and had fed them with honey in rainy weather. She had cleaned the slider every morning, and often found on it even four moths at a time. She thinks that the bees can easily pull them out of their holes before their galleries have been strengthened with cross threads, and cemented with the crumbs of wax, or their excrements. The bees do not always carry them out of the hive, but sometimes leave them on the stool, where the little maggots soon weave a case to conceal themselves in; as she has known them do in a few hours. She found the greatest number of them at about four or five o'clock in the morning.

She resolved to place over Numb. 1. a glass hive, to give the bees an opportunity of working in it. With this view, she cut some rounds off the top of the straw hive, so as to make an opening of four inches, upon which she put a piece of board with a corresponding opening of four inches; and on the twenty-fifth of March 1762, a glass hive was placed over it. She shut up the mouth of the straw hive, in order to oblige the bees to enter by an opening under the glass hive, which she covered, lest the cold might incommode or even kill her bees, which were few in number. Though they increased so much by May as to be equal with Numb. 2. yet the bees never stopped in the glass hive. She judged from this, that they would rather descend, if she gave them a convenient habitation below. She therefore placed under the straw hive a box, which had an opening in it of eight inches, for the bees to pass through. They soon extended their works downward, so that in a fortnight they almost filled the box with combs. On the eighth of July she took away the glass hive; and though it had hitherto served them only as a passage, they were much disconcerted when it was removed: for after she had filled up the opeing in the top of the straw hive with flax and rue, the loaded bees continued for several day to fly round it, though the rue was disagreeable to them, before they would enter by the opening in the box, which was the only one they now had.

It is very remarkable, that the bees made no combs in the glass hive, though they were so fond of entering by it; and yet they descended into the box as soon as it was placed under them. We might have imagined it to be easiest for them to enter below, at the bottom of the box; but instead of so doing, they entered by the glass hive, passed through the straw hive full of combs, and carried their load down into the box. This gave her the first hint, that it was most advisable to put the additional hive into which we would have the bees to work, under the full one, and she has since found it succeed accordingly.

On the twentieth of July, she found that the bees of Numb. 1. had cast out so great a quantity of their young brood,

brood, that ſhe gathered ſome handfuls of it about the hive. The bees continuing to do the ſame next day, ſhe determined to take away the ſtraw hive the day after. For this purpoſe, ſhe choſe eight o'clock in the morning, which ſhe had obſerved to be the time when the greateſt number of bees were gone into the fields. She began by looſening the ſtraw hive from the board on which it reſted, and to which the bees had faſtened it with propolis. She then took the wadding out of the hole in the top of the ſtraw hive; near to which ſome linnen rags were kept ſmoking, and this ſmoke was blown into the hive by a pair of bellows. As ſoon as ſhe judged that moſt of the bees had been forced down into the box, ſhe cauſed a ſtrong iron wire to be drawn through between the hive and the board it reſted on, thereby to cut tranſverſely all the combs which were extended from the hive into the box through the hole of communication. The hive was then taken up with all the combs but one, which ſeparated from the middle of the hive. She carried this comb, with two fingers of each hand, to a table at ſome diſtance, on which the hive had been placed bottom up. The comb which ſhe carried was almoſt covered with bees; and as it fell from the middle of the hive, where the queen generally reſides, ſhe ſearched for her, and found her on the firſt round of the hive, ſcarce able to crawl, being daubed with honey which had flowed from the combs cut through. She waſhed her in a glaſs of water; but finding that this did not entirely carry off the honey which ſtill adhered to her wings, ſhe waſhed her a ſecond time, and put her among ſeveral bees which had alſo been waſhed, but had recovered ſtrength enough to aſſiſt their queen. They immediately ſet themſelves to dry and aſſiſt her. She kept her thus for half an hour, in the preſence of ſeveral curious perſons, who had often ſought in vain for her. As ſoon as ſhe thought her able to make uſe of her legs and wings, ſhe carried her to the ſtool on which the box remained, now to become the only habitation of the bees. Here ſhe was again bruſhed and licked during an hour, by bees which were in great numbers on the forepart of the box, and at laſt ſhe entered.

A farmer with whom this lady kept ſome bees in the country had an old ſtraw hive, which he intended to deſtroy in order to come at their honey and wax. She propoſed to him to follow the ſame ſteps as ſhe had taken with her's, which he agreed to, knowing that he could not loſe any thing by it. Having been taught by experience, ſhe adviſed him to put a box under the hive, rather than a hive over it. As ſhe had obſerved that her own bees had ſo obſtinately adhered to their former paſſage, ſhe adviſed him to place the box at a ſmall diſtance from the place where the hive had ſtood, that the whole might be the newer to them. They ſet to work heartily on the third of July; and by the ſixteenth of Auguſt they had lain in ſo much proviſion, that ſhe determined to take off the hive in the ſame manner as ſhe had done her own. The honey did not run ſo much, becauſe the weather was not ſo hot.

Whatever pains are taken to drive the bees out of the hive by means of ſmoke, many ſtill remain in it. In order to preſerve theſe bees, ſhe found that the beſt way was to ſweep them with the wing of a fowl into a tub of water, as faſt as the combs were taken out. This practice was attended with ſeveral advantages. It prevented the people being ſtung, it cleared the bees of any honey that might have dropped on them, and it made many of their lice fall off them.

In order to take them out of the water, ſhe cauſed a thin linnen cloth to be ſpread over the mouth of an empty tub, in ſuch manner that it hung every where over the brim, and was held by one perſon, whilſt another poured the water, in which the bees were, gradually through it. The bees remained on the cloth. It is eſſential that the quantity of water be large in proportion to the number of bees, and that they be quite ſenſeleſs before they are taken out. If the firſt water taſtes of honey, they ſhould be bathed in a ſecond quantity. M. de Réaumur loſt many bees by not attending to this precaution. When the bees have been ſufficiently bathed, madam Vicat ſpreads them on whited-brown paper, which, with the warm air, ſoon dries them.

It was ſome time before this lady could find the queen of the farmer's hive. The country people who ſaw this operation, were ſtruck with great compaſſion on ſeeing ſo many bees laid out, as it were, upon the table; for they thought them quite dead, and could not believe her when ſhe aſſured them that they would all return to life. By the time ſhe had found the queen, many of the bees had ſo far recovered, as to take care of her. Madam Vicat obſerved on her crocelet a louſe, which ſhe ſtruck off with a pin. She ſaw a ſecond on the hind part of her head; but it ſtuck ſo faſt that ſhe could not remove it; nor was ſhe much ſolicitous about it, becauſe the queen ſeemed to to be in good plight. All the bees were placed on the ſtool before the box; and ſhe was informed next day, that they had all ſoon returned to their companions. Having obſerved in the combs ſome cells which had young in them, ſhe put an additional height under the box, in which ſhe placed the combs with the young in them: and remarking on the twentieth of Auguſt, that there were ſeveral moths under the laſt addition, in which the combs with young were placed, ſhe judged it not to be right to preſerve ſuch combs for the future. Experience has ſince confirmed her in this opinion.

It is generally alledged, that the moths get ſo much the upper hand in the hives by the fourth year, that it is neceſſary to deſtroy the bees on the third year, in order to get the then remaining honey and wax; for that all would otherwiſe fall a prey to the moths. Madam Vicat has now ſhewn, that hives may be preſerved from moths without condemning to the fire thoſe precious labourers, the bees; a practice as barbarous as it is ſenſeleſs; a practice which was ſtrictly forbidden by a Grand Duke of Tuſcany, under the penalty of ſevere puniſhment, as we are informed by M. de Réaumur. If care is not taken, even three years will be too long a time to allow; for the moths will frequently deſtroy a hive the very firſt year.

The lice which ſtick to bees are not generally thought to be prejudicial to them; and this may be true when there are but few of thoſe vermin; but when every bee in a hive has two, or perhaps three lice upon it, as is often the caſe, we may believe that the bees are greatly incommoded by them: indeed we may be aſſured of it, by their uſing every means in their power, though ineffectually, to get rid of them. M. de Réaumur declares, that he cannot think well of a hive in which the greateſt number of bees have lice on them.

Madam Vicat had a hive near a chair in her garden, in which ſhe uſed to ſit at work for hours. She one day ſaw many bees endeavouring to rid themſelves of theſe troubleſome enemies, and endeavoured, but to little purpoſe, to aſſiſt them, by killing the lice with her ſciſſars. Recollecting that tobacco is a poiſon to many inſects, ſhe immediately ſtrewed a little Morocco tobacco over ſome bees which had lice on them. The lice fell off inſtantly, as dead. In order to be aſſured that tobacco did not hurt the bees, ſhe confined ſome which were louſy, under a glaſs placed on paper ſtrewed with tobacco. After the bees had paſſed ſeveral times over the tobacco, the lice fell off them dead. She left the bees in the glaſs three hours, and at the end of that time they appeared vigorous and well.

Mr. Thorley tells us, that the beſt time to plant colonies of bees, is either in ſpring with new ſtocks full of bees, or in ſummer with ſwarms. If ſwarms are uſed, procure, if poſſible, two of the ſame day; hive them either in two boxes, or in a hive and a box; at night place them in the bee-houſe, one over the other, and, with a knife and a little lime and hair, ſtop cloſe the mouth of the hive, or upper-box, ſo that not a bee may be able to go in or out, but at the front door. This done, you will, in a week or ten days, with pleaſure ſee the combs appear in the boxes; but if it be an hive, nothing can be ſeen till the bees have wrought down into the box. Never plant a colony with a ſingle ſwarm, as Mr. Thorley ſays he has ſometimes done, but with little ſucceſs.

When the ſecond box, or the box under the hive, appears full of bees and combs, it is time to raiſe your colony. This ſhould be done in the duſk of the evening, and in the following manner.

Place your empty box, with the ſliding ſhutter drawn back, behind the houſe, near the colony that is to be raiſed, and at nearly the height of the floor; then lifting

ing up the colony with what expedition you can, let the empty box be put in the place where it is to ftand, and the colony upon it, and fhut up the mouth of the then upper box, with lime and hair as before directed.

When, by the help of the windows in the back of the boxes, you find the middle box full of combs, and a quantity of honey fealed up in it, the loweft box half full of combs, and few bees in the uppermoft box, proceed thus.

About five o'clock in the afternoon, drive clofe, with a mallet, the fliding fhutter under the hive or box that is to be taken from the colony. If the combs are new, the fhutter may be forced home without a mallet; but be fure it be clofe that no bees may afcend into the hive or box to be removed. After this, fhut clofe he doors of your houfe, and leave the bees thus cut off from the reft of their companions for the fpace of half an hour or more. In this time, having loft their queen, they will fill themfelves with honey, and be impatient to be fet at liberty.

If, in this interval, you examine the box or boxes beneath, and obferve all to be quiet in them, you may be confident that the queen is there, and in fafety. Hereupon raife the back part of the hive or box fo far, by a piece of wood flipped under it, as to give the prifoners room to come out, and they will return to their fellows: then lifting the box from off the colony, and turning it bottom upmoft, cover it with a cloth all night; and the next morning, when this cloth is removed, the bees that may have remained in it will return to the colony. Thus you have a hive or box of honey, and all your bees fafe.

Mr. Thorley adds, that the method he has purfued with great fuccefs for many years, and which he recommends to the public, as the moft effectual for preferving bees in common hives, is incorporation, or uniting two ftocks into one, by the help of a peculiar fume or opiate, which will put them intirely in your power for a time, to divide and difpofe of at pleafure. But as that dominion over them will be of fhort duration, you muft be expeditious in this bufinefs.

The queen is immediately to be fearched for, and killed. Hives which have fwarmed twice, and are confequently reduced in their numbers, are the fitteft to be joined together, as this will greatly ftrengthen and improve them. If a hive which you would take is both rich in honey, and full of bees, it is but dividing the bees into two parts, and putting them into two boxes, inftead of one. Examine whether the ftock to which you intend to join the bees of another, have honey enough in it to maintain the bees of both: it fhould weigh full twenty pounds.

The narcotic, or ftupefying fume, is made with the *fungus maximus* or *pulverulentus*, the large mufhroom, commonly known by the name bunt, puckfift, or frogcheefe. It is as big as a man's head, or bigger: when ripe, it is of a brown colour, turns to powder, and is exceeding light. Put one of thefe pucks into a large paper, prefs it therein to two-thirds, or near half the bulk of its former fize, and tie it up very clofe; then put it into an oven fome time after the houfhold bread has been drawn, and let it remain there all night: when it is dry enough to hold fire, it is fit for ufe. The manner of ufing it is thus:

Cut off a piece of the puck, as large as a hen's egg, and fix it in the end of a fmall ftick flit for that purpofe, and fharpened at the other end, which place fo that the puck may hang near the middle of an empty hive. This hive muft be fet with the mouth upward, in a pail or bucket, which fhall hold it fteady, near the ftock you intend to take. This done, fet fire to the puck, and immediately place the ftock of bees over it, tying a cloth round the hives, that no fmoke may come forth. In a minute's time, or little more, you will hear the bees fall like drops of hail into the empty hive. You may then beat the top of the full hive gently with your hand, to get as many of them as you can: after this, loofing the cloth, lift the hive off to a table, knock it feveral times againft the table, feveral more bees will tumble out, and perhaps the queen among them. She often is one of the laft that falls. If fhe is not there, fearch for her among the main body in the empty hive, fpreading them for this purpofe on a table.

You muft proceed in the fame manner with the other hive, with the bees of which thefe are to be united. One of the queens being fecured, you muft put the bees of both hives together, mingle them thoroughly, and drop them among the combs of the hive which they are intended to inhabit. When they are all in, cover it with a packing or coarfe cloth, which will admit air, and let them remain fhut up all that night, and the next day. You will foon be fenfible that they are awaked from this fleep.

The fecond night after their union, in the dufk of the evening, gently remove the cloth from off the mouth of the hive, (take care of yourfelf) and the bees will immediately fally forth with a great noife; but being too late, they will foon return; then inferting two pieces of tobacco-pipes to let in air, keep them confined for three or four days, after which the door may be left open.

Providence has ordained that infects which feed on leaves, flowers, and green fucculent plants, are in an infenfible or torpid ftate from the time that the winter's cold has deprived them of the means of fubfiftence. Thus the bees, during winter, are in fo lethargic a ftate, that little food fupports them: but as the weather is very changeable, and every warm or funny day revives them, and prompts them to return to exercife, food becomes neceffary on thefe occafions. Mr. White very judicioufly obferves, that a greater degree of cold than is commonly imagined to be proper for bees, is favourable to them in winter. If a fharp froft, fays that experienced gentleman, continues for two or three months, without intermiffion, you may obferve, through your glafs, that the bees are all this time clofely linked together in clufters between the combs. If they are not altogether without motion, yet it is certain they ftir not from their places, while the cold continues, and therefore eat not at all.

A colony of bees therefore placed on the north-fide of a building will wafte much lefs of their provifions, than others which ftand in the fun; for coming feldom forth, they eat little; and yet in the fpring are as forward to work and fwarm, as thofe which had twice as much honey in the preceding autumn. The owner fhould however examine their ftate in the winter, and if he finds that inftead of being cluftered between the combs, they fall down in numbers on the ftool or bottom of the hive, the hive fhould be immediately carried to a warmer place, where they foon recover.

Moft writers on bees have obferved, that thefe infects are fubject to a kind of purging in the fpring, which is often fatal to the whole hive. Madam Vicat afcribes this diftemper to the honey being candied in the hive by the cold. But Columella defcribes it as an annual diftemper which feizes them in the fpring, when the fpurge bloffoms, and the elm difclofes its feeds; for that the bees, being allured by the firft flowers, feed fo greedily upon them, that they furfeit themfelves therewith, and die of a loofenefs, if they are not fpeedily relieved. He relates Hyginus's advifing, in this cafe, to cover the bees with afhes of the fig-tree; and affirms, that, being enlivened by the warmth of thefe afhes, the bees will revive in two hours, and go into a hive brought to them. Columella advifes giving them rofemary and honey diluted with water. Ariftomachus feems to have prefcribed the moft effectual cure, namely, to take away all the vitiated combs, that is, all the combs in which there are open cells appearing to contain candied honey.

The authors of the *Maifon Ruftique*, impute this purging to the bees feeding on pure honey, which does not form a food fufficiently fubftantial for them, unlefs they have bee-bread to eat at the fame time; and advife giving them a honey-comb taken from another hive, the cells of which are filled with crude wax or bee-bread.

The common practice is to feed them in the autumn, giving them as much honey as will bring the whole weight of the hive to near twenty pounds. To this end, the honey is diluted with water, and then put into an empty comb, fplit reeds, or, as Columella directs, upon clean wool, which the bees will fuck perfectly dry.

The following directions given for this purpofe in the *Maifon Ruftique*, feem to be very judicious. Repleni£h the weak hives in September, with fuch a portion of combs

combs full of honey, taken from other hives, as ſhall be judged to be a ſufficient ſupply for them. In order to do this, turn up the weak hive, after taking the precaution of defending yourſelf with the ſmoke of rags, cut out the empty combs, and put the full ones in their place, where ſecure them with pieces of wood run acroſs, in ſuch manner that they may not fall down when the hive is returned to its place. The bees will ſoon fix them more effectually. If this method be thought too troubleſome, ſet under the hive a plate of liquid honey, unmixed with water, with ſtraws laid acroſs it, and over theſe a paper pierced full of holes, through which the bees will ſuck the honey, without daubing themſelves. This ſhould be done in cloudy or rainy weather, when the bees ſtir leaſt abroad; and the hive ſhould be covered, to protect the bees from robbers, who might be allured to it by the ſmell of honey.

Another circumſtance which may render it very neceſſary to feed the bees, is, when ſeveral days of bad weather enſue immediately after they have ſwarmed; for then, being deſtitute of every ſupply beyond what they carried with them, they may be in great danger of being ſtarved. In this caſe honey ſhould be given them in proportion to the duration of the bad weather.

But it is not enough to know how to manage bees in all ſeaſons; it will be alſo requiſite to know how to defend them from their enemies; among which hornets and waſps, and eſpecially the ſpecies of waſps which are ſcarcely larger than bees, are very formidable; for they ſeize a bee loaded with honey. If this robbery is committed near the mouth of the hive, they carry off the bee to a place of greater ſafety. Their neſts ſhould therefore be carefully deſtroyed, by pouring plenty of boiling water into them; for this is by much the ſafeſt method.

The field-mouſe is an enemy to be carefully guarded againſt as ſoon as the cold begins to approach: for if it enters at that ſeaſon, it makes dreadful havock. At firſt it deſtroys the loweſt parts of the combs; but as the weather grows colder, and the bees more torpid, it aſcends up the hive, and ſeizes on the richeſt treaſure: nor does the evil end here: for other bees, ſmelling the honey ſpilt by the mouſe, fall upon the hive, and rob it of what remained; or as ſoon as the warm weather returns, and the bees ſtir about, they are ſometimes ſo diſguſted at the havock made by the mouſe, that they deſert the hive. The only way to guard againſt this, is to prevent its entering into a hive. Whilſt the bees continue in their vigorous ſtate, it dares not attack them: therefore, as ſoon as the cold approaches, the entrance to the hives ſhould be leſſened.

Bees may themſelves be reckoned enemies to bees: for they ſometimes wage cruel wars againſt each other. Their fighting and plundering one another ought chiefly to be imputed, as Mr. Thorley obſerves, either to their perfect abhorrence of ſloth and idleneſs, or to their inſatiable thirſt for honey: for when, in ſpring or autumn, the weather is fair, but no honey can be collected from plants, and is to be found only in the hives of other bees, they will venture their lives to get it there.

Dr. Warder aſſigns another cauſe of their fighting, which is, the neceſſity that the bees are reduced to when their own hive has been plundered, at a ſeaſon when it is too late for them to repair the loſs by any induſtry in the fields.

Sometimes one of the queens is killed in battle. In this caſe, the bees of both hives unite as ſoon as her death is generally known among them. All then become one people: the vanquiſhed go off with the robbers, richly laden with their own ſpoils, and return every day, with their new aſſociates, to pillage their old habitation. This cauſes a throng unuſual for the ſeaſon, at the door of the hive they are plundering; and if the owner lifts it up at night, when all are gone home, he will find it empty of inhabitants; though there perhaps will remain in it ſome honey, which he takes as his property.

When two ſwarms take flight at the ſame time, they ſometimes quarrel, and great numbers are deſtroyed on both ſides, till one of the queens is ſlain. This ends the conteſt, and the bees of both ſides unite under the ſurviving ſovereign.

Robbers make their attacks chiefly in the latter end of July, and the month of Auguſt. They appear to act with caution at firſt, and to procure themſelves an entrance by ſtealth; not pitching boldly like the native bees, and then entering at once in at the door. If they are encouraged by ſucceſs, they return in greater parties, ſometimes all the bees of a hive, and endeavour to force that entrance which they ſought before with ſo much caution. They come in ſuch numbers, as frequently to make thoſe who are not acquainted with theſe ſcenes, miſtake them for new ſwarms: but the number of dead bees ſtrewed on the ground, ſoon convince them of this error. Columella adviſes to kill the queen, if poſſible; but the moſt effectual way to prevent the loſs of bees, as well as of honey, occaſioned by theſe robberies, is, early in the autumn, to leſſen the entrance into the hive, as before directed, ſo as to leave room for only two or three bees to paſs a-breaſt.

In the third claſs of enemies to bees is a ſmall caterpillar, termed the wax-worm, or wax-moth, becauſe of the havock it makes on wax. It is tender in its frame, unarmed and defenceleſs; and yet can ſubſiſt itſelf in the midſt, and at the coſt, of the moſt numerous hive. A few of theſe little caterpillars will deſtroy and break to pieces the combs of a hive, build up new edifices for lodging themſelves in it, and finally force the bees to quit the place.

This inſect is of the ſpecies of the falſe-moth, and is extremely nimble. It is enough for it to get into a hive unawares. It runs ſo very ſwiftly, that it paſſes unperceived, and ſlides into ſome narrow place between the combs, perhaps inacceſſible to bees, there to lay its eggs in ſecurity. This done, it makes its eſcape as well as it can. From each of theſe eggs proceeds a caterpillar, which eſcapes certain death merely by its extreme ſmallneſs, and the quickneſs with which it ſpins and enwraps itſelf in a covering ſufficient to ſecure it from all harm. This covering, or tube, is glued to the wax which the caterpillar feeds on, and this inſect lengthens the tube as it eats the wax, till at laſt it ſhuts itſelf up, in order to be transformed into a chryſalis. Several caterpillars, and conſequently ſeveral moths, muſt proceed from the eggs which the males and females engender. Probably the bees deſtroy great numbers of the moths: however, if a ſingle female has an opportunity to lay her eggs, ſhe is ſo exceedingly prolific, that this ſecond brood may quite overſpread the hive. If one of the impregnated females eſcapes out of the hive by means of her great nimbleneſs, ſhe ſeeks out another hive, in which ſhe ſpreads the ſame ſource of miſchief.

The only method of deſtroying theſe pernicious inſects is to take away the infected hive; and after clearing it from the moths, reſtore it to the proper owners, who will now work with greater diligence and reſolution.

The next particular neceſſary to be known, is how to ſeparate the honey from the wax. In order to this, the combs ſhould be laid in a place perfectly ſecure from the acceſs of bees; for otherwiſe the bees would not only carry off much honey, but alſo be extremely troubleſome, by ſtinging the people at work. It is proper to burn cow-dung, or rotten hay, at the doors and windows of this place; becauſe the ſmell of the ſmoke ariſing from thence is ſo diſagreeable to the bees, that it will drive them away. If any bees remain in the comb, they ſhould be bruſhed off with the wing of a fowl into a tub of water, and being afterwards dried in another place, they will fly back to their hive. If the combs are taken out of the hive before the end of autumn, there are generally young bees in them. The parts of the combs in which theſe are ſhould be laid aſide, for they would give a bad taſte to the honey. The bee-bread muſt alſo be ſeparated, and both ſhould be melted with the wax.

Before the combs are laid to drain out their honey, they ſhould be carefully cleaned of every ſort of filth, or inſects. The cruſt with which the bees cover the honey in them ſhould then be pared off with a ſharp, thin, broad knife, and the combs themſelves ſhould be divided through

through the middle, in such manner as to render the cells open at both ends, that the honey may flow the more freely out of them. The combs should be laid in this state on sieves, or some other contrivance, which will afford the honey a free passage. It will run quite clear; and the honey thus obtained should be kept by itself, as being the purest and best.

The combs which are but partly filled, and also those that were full and have done running, are broken by hand, and the honey in them is squeezed out. Some put the broken combs into a strong bag, and then use a press to squeeze the honey out of them; and even warm the broken combs with the help of fire: but neither of these last consider that, in both these ways, much of the wax passes through the bag with the honey, and that the wax being of greater value than the honey, the owner sustains a loss in that respect, besides that his honey becomes the less valuable, in proportion to its being less pure. It is true, that great part of the wax thus mixed with the honey soon rises to the surface, and may be taken off, especially after the honey is grown hard.

The makers of mead need not be extremely solicitous about separating the honey so very perfectly from the wax, because, by washing the wax in cold water, the honey will dissolve in the water, and the wax being strained from it by running the water through a coarse cloth, neither bad taste nor impurity will be communicated by it to the water, which may afterwards be used for making mead. The wax that has been skimmed off the honey separated by pressure, should be washed in the same manner; because, by this means, no part of the wax will be lost.

The goodness and flavour of honey depend on the fragrance of the plants from which the bees collect it: and hence it is that the honey of different places is held in different degrees of estimation. That which is made early in the year is also preferred to what is collected in the latter end of the season.

In order to obtain the wax in a pure state, what remains of the combs after separating the honey, together with the combs which contain bee-bread and young bees or maggots, is put into a copper with a sufficient quantity of clean water, which is made to boil over a slow fire, and stirred frequently with a stick. When the wax is melted, it is run through bags, which are put into a press, to separate the wax perfectly. The wax runs from the press into a vessel placed underneath, with some water in it, to prevent the wax from sticking to it. What remains after the pressure may be again boiled in water, in order to obtain more wax from it: and this should be repeated by slow boilings, rather than by boiling it strongly at once.

When all the wax is thus separated from the dregs, it is again melted in water, over a very gentle fire, and skimmed clean whilst any scum arises. It is then poured into vessels suited to give it the desired form, after previously putting into them a little water, to keep the wax from sticking to them. These vessels are then carried into a place where the wax may cool gradually. It is found that, the larger the cakes of wax are, the better the wax keeps, and the higher price it brings; also, that the more gentle it has been boiled, the better it likewise is: for too hasty boiling renders it hard, and this increases the difficulty of bleaching it. Whatever filth sticks to the bottom of the cake is scraped off with a knife.

We shall conclude this article with a few directions for purchasing bees; which should always be done in the spring, as the dangers of the winter are then over. The summer is an improper time for buying them, because the heat of the weather then softens the wax, and thereby renders the combs liable to break, if they are not very well secured. The honey too, being then thinner than at other times, is more apt to run out of the cells, which is attended with a double disadvantage, namely, the loss of the honey, and the daubing of the bees, whereby many of them may be destroyed. A first and strong swarm may indeed be be carried away in the night after it has been hived.

The hive should be full of combs, and well stored with bees. The purchaser should examine the wax, in order to know the age of the hive. The combs of a year old are white; those of two years are dark coloured, or yellow; and where the combs are black, the hive should be rejected; because old hives are most apt to be infected with the moth, and most liable to other accidents. For this reason, the state of the combs should be examined as high up as possible; because the lower parts of the combs may have been cut off, and renewed in the preceding summer. It sometimes, though rarely, happens, that two queens continue to govern separately in the same hive; and in this case a large comb forms the barrier. Such hives should be rejected, because there is not in them that harmony which is necessary for the success of the bees.

In order to judge of the state of the hive, it may be raised a little in the evening, so as to admit a more than usual degree of cold; for this will drive the bees to the top of the hive, and so benumb them, that the next morning there will be no danger of their stinging. If any such danger does appear, a pot of lighted charcoal, with some linnen rags upon it, may be got ready, and held under the hive whilst it is pulled back in order to be examined.

We may also judge of the thriving state of the hive by the following appearances. Bees which are in good condition will get into the fields early in the morning, return loaded, enter boldly, and not come out of the hive in bad weather; for when they do, this indicates that they are in great want of provisions. They are alert on the least disturbance; they preserve their hive free from all filth, or dead nymphs or bees; they are ready to assist the bees which return loaded from the fields, and to defend the hive against every enemy that dares to approach: they make a continual humming noise, which increases on the least touch. Indeed, by the loudness of the humming, we may judge of the strength and progress of the hive, and therefore this should be frequently noticed, to enable us to form the better judgment of the present state the bees are in. *Columella, lib. IX. Maison Rustique, tom. I. Memoires, &c. de la Societé de Berne: Anné* 1764. *Réamur's Memoires pour servir à l'Histoire Naturelle des Insects, tom. V. Thorley's Enquiry into the Nature, &c. of Bees. Warder's Monarchy of Bees. White's collateral Bee-Boxes. Mill's Essay on the Management of Bees.*

BEECH, the name of a well known tree, and of which some planters suppose there are two distinct species; calling the one the mountain or wild beech, and the other the common beech. They also say, that the wood of the former is whiter than that of the latter; but Mr. Miller assures us that there is only one species of this tree, and that the difference in the colour of the wood arises from the difference in the soils.

This tree is propagated by sowing the mast, which may be done at any time from October to February, only observing to secure the seeds from vermin when early sown; and, if this be carefully done, the sooner they are sown after they are fully ripe, the better: a small spot of ground will be sufficient for raising a great number of these trees from seed; for if the plants are come up very thick, the strongest of them should be drawn out the autumn following, that those left may have room to grow; so that a seed-bed, carefully managed, will afford a three year's draught of young plants, which should be planted in a nursery, and, if designed for timber trees, at three feet distant row from row, and eighteen inches asunder in the rows.

But if they are designed for hedges, to which the tree is very well adapted, the distance need not be so great; two feet row from row, and one foot in the rows, will be sufficient. In this nursery they may remain two or three years, observing to dig up the ground between the roots, at least once a year, that their tender roots may the better extend themselves every way: but be careful not to cut or bruise their roots, which is injurious to all young trees; nor should you ever dig the ground in summer, when the earth is hot and dry; for by letting in the rays of the sun to the roots, the young trees are often destroyed.

This tree will grow to a considerable stature, though the soil be stoney and barren, as also upon the declivities of hills and chalky mountains, where they will resist the wind

wind better than moſt other trees; but then the nurſeries for the young trees ought to be made upon the ſame ſoil; for if they are raiſed on good ground, and in a warm expoſure, and afterwards tranſplanted into a bleak, barren ſituation, they ſeldom thrive. The nurſery ſhould therefore be made upon the ſame ſoil, where the plantation is intended, and the plants drawn annually to extend the plantation.

The tree is very proper to form large hedges to ſurround plantations, or wilderneſs quarters; and may be kept in a regular figure, if ſheared twice a year; eſpecially if they ſhoot ſtrong; in which caſe if they are neglected but a ſeaſon or two, it will be very difficult to reduce them again.

The ſhade of this tree is very injurious to moſt ſorts of plants which grow near it, but is generally believed to be very ſalubrious to human bodies.

It delights in a chalky or ſtony ground, where it generally grows very faſt; the bark of the trees in ſuch land is clear and ſmooth, and although the timber is not ſo valuable as that of many other trees, yet as it will thrive on ſuch ſoils, and in ſuch ſituations where few better trees will grow, the planting of them ſhould be encouraged, eſpecially as the trees afford an agreeable ſhade, and the leaves make a fine appearance in ſummer, and continue green as long in autumn as any of the deciduous trees; therefore in parks, and other plantations for pleaſure, this tree deſerves to be cultivated among thoſe of the firſt claſs, eſpecially where the ſoil is adapted to it. *Miller's Gard. Dict.*

The timber is of great uſe to turners for making trenchers, diſhes, trays, &c. and alſo to carpenters for making ſtools, bedſteads, &c. Shipwrights likewiſe often uſe it for the keels of ſhips; and it is eſteemed the beſt wood for firing. The thin lamina, or ſcale of the wood, commonly called paſte-board, is uſed in making band-boxes, hat-caſes, &c.

Beech wood is well known to be ſubject to worms, which ſoon deſtroy it. This worm is ſuppoſed to feed upon the ſap remaining in the wood after it is cut into ſcantlings, and worked up for uſe. If therefore the ſap can, by any means, be extracted, the wood will be much leſs ſubject to decay. Upon this principle, a correſpondent of the authors of the *Muſeum Ruſticum* greatly improved the wood, by laying it a reaſonable time in a pond, and afterwards drying it in the ſhade; by which means the timber when applied to uſe, was at leaſt as good, and as durable as elm. He adds, that by boiling the wood intended for ſmaller works, ſuch as bowls, trenchers, chairs, &c. two or three hours in a copper filled with water, all the ſap will be extracted, the wood will work pleaſanter, be more beautiful when finiſhed, and laſt, without compariſon, longer. *Muſeum Ruſticum, vol.* II. *pag.* 135.

BEECH *maſt*, the ſeed of the beech-tree.

This maſt is very good for feeding ſwine; ſo that in ſome counties of England, where there are large woods of beech-trees, the hogs are fed for months together on the maſt only. They thrive prodigiouſly on this food only, ſo that many porkers are killed in a year fatted with beech-maſt, without the aſſiſtance of any other food. It is, however, the better way to take them up, and give them either pollard, barley-meal, or peaſe, for a month or five weeks, when they will be fit for the tub.

But beech-maſt, like acorns, are apt to give the hogs a diſtemper called the garget; which may be effectually prevented, if a few peaſe or beans moiſtened with water, and ſprinkled over with antimony finely powdered, be given them every other day for a fortnight or three weeks. *Muſeum Ruſticum, vol.* I. *pag.* 474.

BEES-NEST, or *birds-neſt*, the ſame with wild carrot. *See the article Wild* CARROT.

BEER, a common and well known liquor, made of malt and hops, and uſed in various parts of Europe, particularly in thoſe where the vine will not flouriſh, and where cider is ſcarce. *See the article* BREWING.

The grounds, or ſettlings of beer, &c. form a very rich manure.

BEESTINGS, the firſt milk taken from a cow after calving.

If this milk be not taken away clean from the cow upon her firſt calving, it will often make the cow's milk to dry away. Nor ſhould the beeſtings be given to the calf, as it is very apt to ſurfeit. *Liſle's Huſbandry, vol.* II. *pag.* 143.

BEET, the name of a plant commonly cultivated in gardens, and of which there are two ſpecies, commonly diſtinguiſhed by the names of white and red beet: the former is cultivated for its leaves, and the latter for its roots.

The roots of the white beet ſeldom grow larger than a man's thumb; the ſpikes of the flowers come out from the wings of the leaves, which are long, and have many narrow leaves placed between the flowers. The lower leaves are thick and ſucculent, and their foot-ſtalks are broad. The varieties of this ſort are, the white beet, the green beet, and the Swiſs, or chard beet; but theſe will all vary from one to the other by culture.

It is commonly ſown by itſelf, and not mixed with other crops, the beginning of March, upon an open ſpot of ground, not too moiſt. When the plants have put out four leaves, the ground ſhould be hoed, as is practiſed for carrots, carefully cutting up all the weeds, and alſo the plants where they are too near each other, leaving them at leaſt ſix inches aſunder. In three weeks or a month's time, the ground ſhould be a ſecond time hoed over, to cut up the weeds, and then ſet the plants at a greater diſtance; for by this time they will be paſt danger, ſo ſhould not be left nearer than eight or ten inches, if regard is had to the goodneſs of the leaves; and if it is of the Swiſs kind, with broad leaves, the plants muſt not be nearer than a foot: in ſix weeks after, the ground ſhould be hoed over a third time; which, if properly done, will deſtroy all the weeds; ſo that after this, the plants will ſpread and prevent the weeds from growing, therefore will want but little cleaning for a conſiderable time, and the leaves will ſoon be fit for uſe, when the outer larger leaves ſhould be firſt gathered; leaving the ſmall inner leaves to grow larger; ſo that a ſmall ſpot of ground will ſupply a moderate family, and furniſh a new ſupply of leaves the whole year, provided the plants are not permitted to run up to ſeed, for after that their leaves will not be good. *Miller's Gard. Dict.*

M. de Chateauvieux tells us, that of this plant, cultivated according to the principles of the new huſbandry, produced leaves three or four inches broader than thoſe of the ſame kind of plants in his kitchen garden. By this method of culture it will yield an amazing quantity of leaves, which being very pleaſant to the taſte, will prove good food for cattle; and Mr. Roque has found by experience, that cows fed with them give a large quantity of milk. This plant, according to Mr. Roque's obſervations, grows above an inch a day, and is beſt ſown in March. A buſhel is enough for an acre, and will not coſt above ten ſhillings. It thrives beſt in a deep, rich, light ſoil: the ſtalks are very rich and ſucculent, and therefore the cows ſhould eat it green

The red beet hath large thick ſucculent leaves, which are for the moſt part of a dark green, or purple colour. The roots of this are large, and of a deep red colour, on which their goodneſs depends; for the larger theſe roots grow, the tenderer they will be; and the deeper their colour, the more they are eſteemed. The varieties of this are, the common red beet, the turnip-rooted red beet, and the green leaved red beet.

It is frequently ſown with carrots, parſnips, or onions, by the kitchen gardeners near London, who draw up their carrots or onions when they are young, whereby the beets will have room to grow, when the other crops are gathered; but where the crops are not timely removed from them, it will be a better method to ſow them ſeparately. This ſort requires a deep light ſoil, for as their roots run deep in the ground, ſo in ſhallow ground, they will be ſhort and ſtringy. The ſeeds ſhould be ſown in March, and muſt be treated in the ſame manner as the white beet; but the plants ſhould not be left nearer than a foot diſtance, or in good land a foot and an half, for the leaves will cover the ground at that diſtance. The roots will be fit for uſe in the autumn, and continue good all the winter; but in the ſpring, when they begin to ſhoot, they will be hard and ſtringy. *Miller's Gard. Dict.*

That attentive cultivator M. de Chateauvieux raiſed the red beet according to the principles of the new huſbandry; and on digging up the roots on the twenty-fifth of October, he found them all nearly of the ſame ſize, which was from five to ſix inches in diameter towards the top, or thickeſt part. Theſe roots ſeem to promiſe fair for being an excellent food for cattle, and would be well worth the trial, as they will produce a very large increaſe, and are eaſily cultivated.

BEETLE, a wooden inſtrument in the form of a mallet, but much larger, uſed in driving piles, wedges, hedge-ſtakes, &c.

BEETLE, is alſo the name of a flying inſect, of which there are a great variety of ſpecies; but they have all of them caſes over their wings to defend them from hard bodies, which they often meet with when they dig holes in the ground, or gnaw rotten wood with their teeth, to make themſelves houſes or neſts. When they fly they fill the air with a humming noiſe, and, perhaps, greater than that of any other inſect. There are different ſorts of beetles, ſome being large with horns, and others ſmall, and without horns.

BEEVES, a general name for oxen, or black cattle in general.

BEHEN, a ſpecies of chickweed, frequently called ſpattling-poppy. *See* CHICKWEED.

BENT-*graſs*, a ſpecies of graſs common in paſture grounds; there are ſeveral ſorts of this graſs, particularly that called fine bent, for the gathering the ſeeds of which the ſociety offered a premium. We have given a figure of one of the ſpecies of bent-graſs, on Plate III. Fig. 11.

BERE, or *bear*, a ſpecies of barley. *See the article* BARLEY.

BERNE-MACHINE, the name of an engine for rooting up trees, invented by Peter Sommer, a native of Berne in Switzerland.

A model of this machine was ſent by the Berne Society to the Society for the Encouragement of Arts in London, and from this model the drawing on Plate IV. Fig. 1. was made. The engine conſiſts of three principal parts, the beam, the ram, and the lever. The beam A B C, of which only one ſide is ſeen in the figure, is compoſed of two ſtout planks of oak of three inches thick at leaſt, and ſeparated by two tranſverſe pieces of the ſame wood at A and C, about three inches thick. Theſe planks are bored through with correſponding holes, as repreſented in the figure, to receive iron pins, upon which the lever acts between the two ſides of the beam, and which are ſhifted higher and higher, as the tree is raiſed, or rather puſhed out of its place. The ſides are well ſecured at top and bottom, by ſtrong iron hoops.

The iron pins on which the lever reſts, ſhould be an inch and a quarter, and the holes through which they paſs, an inch and a half in diameter. The poſition of theſe holes is ſufficiently indicated by the figure.

The foot of the beam, when the machine is in action, is ſecured by ſtakes repreſented at G, driven into the earth.

The ram D, which is made of oak, elm, or ſome other ſtrong wood, is capped with three ſtrong iron ſpikes, repreſented at *f*, which take faſt hold of the tree. This ram is ſix or eight inches ſquare, and a ſlit is cut lengthwiſe through the middle of it, from its lower end at K, to the firſt ferule *a*, in order to allow room for the chain *g b*, to play round the pulley K, which ſhould be four inches thick, and nine inches in diameter. This ram is raiſed by means of the chain *g b*, which ſhould be about ten feet long, with links four inches and three quarters in length, and an inch thick. One end of this chain is faſtened to the top of the beam at C, while the other, after paſſing through the lower part of the ram, and over the pulley K, terminates in a ring or link repreſented Fig. 3. the two ears *m*, *n*, of which ſerve to keep it in a true poſition between the two planks of the beam. In this ring the hook P is inſerted.

The hook is repreſented in profile, Fig. 2. where F is the part that takes hold of the ring. But it muſt be obſerved, that the parts of this machine, repreſented in Fig. 2, 3. are drawn on a ſcale twice as large as the whole engine, Fig. 1.

The hook F, Fig. 2. ſhould be made of very tough iron, as well as the handle D, and the arch E *e*. This handle ſhould be two inches thick at *z*, where it joins to the hook, and the thickneſs gradually leſſen by degrees up to the arch, which need not be more than half an inch thick.

On each ſide of the pin *z*, is a ſemi-circular notch, *x*, *y*, which reſts alternately on the pins, when the machine is worked. The hole D, and the arch *E e*, ſerve to fix a long lever of wood E F, Fig. 1. by means of two iron pins; and by this contrivance the lever is either raiſed or depreſſed at pleaſure, in order to render the working of the machine eaſy in whatever part of the beam the lever may be placed: for without this contrivance the extremity of the lever E F, would, when the handle *d* F was near the top of the beam C, be much higher than men ſtanding upon the ground could reach. It muſt, however, be remembered that the lever is often ſhortened by this contrivance, and conſequently its power leſſened.

The machine is worked in the following method: it is placed againſt a tree, in the manner repreſented in the figure, ſo that the iron ſpikes at *f* may have hold of the tree, and the end of the beam A be ſupported by ſtakes repreſented at G. The iron handle, Fig. 2. is placed in the opening between the two planks of the beam, and the wooden lever fixed to it by means of the iron pins already mentioned. The hook F takes hold of the chain, and one of the iron pins is thruſt into the outer row of holes, by which means the outer notch *x* will reſt on the pin, which will be now the center of motion; and the end of the lever E, Fig. 1. being preſſed downwards, the other notch *y*, Fig. 2. will be raiſed, and at the ſame time the chain, and conſequently the ram. The other iron pin is now to be thruſt into the hole in the inner row, next above that which was before the center of motion, and the end of the lever E, Fig. 1. elevated, or puſhed upwards, the latter pin on which the notch *y* reſts, now becoming the center of motion. By this alternate motion of the lever, and ſhifting the pins, the chain is drawn upwards over the pulley K, and conſequently the whole force of the engine exerted againſt the tree. There is a ſmall wheel at L, in order to leſſen the friction of that part of the machine.

From this account the reader will very eaſily perceive that the machine is nothing more than a ſingle pulley, compounded with a lever of the firſt and ſecond order; and therefore its power may be eaſily computed from the nature of the pulley and lever.

It muſt, however, be remembered, that as the puſh of the engine is given in an oblique direction, it will exert a greater or leſſer force againſt the horizontal roots of the tree in proportion to the angle formed by the machine with the plane of the horizon; and that the angle of 45° is the maximum, or that when the machine will exert its greateſt force againſt the horizontal roots of the tree.

M. N. E. Tſcharner, ſecretary to the Berne Society, obſerves, in a letter ſent to the Society for the Encouragement of Arts, &c. in London, and dated Berne, Jan. 10th 1763, that by repeating experiments with this machine he has found that the chain *g b*, is ſo far from giving an additional power, that it hinders the play and effect of the engine by its friction; and that when the ram preſſes ſtrongly againſt the beams, the chain is ſqueezed between the beams ſo as to render the upper holes uſeleſs, and prevents the machine from being worked out to its full length; in conſequence of which it is obliged to be removed from its firſt place, and fixed again anew; which neceſſarily occaſions a loſs of time. He alſo found that the ram was too ſhort. He has therefore taken away the chain, and lengthened the ram four feet.

The inconvenience of the chain was immediately ſeen by the Society for the Encouragement of Arts, and therefore the machine at large made by their directions, was conſtructed without it. The ram moved between the two cheeks of the beam, and was puſhed up by the alternate

alternate motion of the lever. And that the force of the machine might not be lessened by the removal of the chain, the lever was made of twice the length of that in the Berne model.

It will be very readily granted, that an engine constructed in this manner will be very useful in saving the labour of men; though very inadequate to the task intended, that of throwing down trees. For it sufficiently appeared from experiments made by the committee of mechanics, that trees above sixteeen inches diameter, especially if oaks or elms, cannot be thrown down with this engine, without the assistance of cutting their roots.

BEVERAGE, drink, liquor to be drank.

BIENNIAL *plants*, such as continue two years.

BIG, the same with bear, or square barley. *See the article* BARLEY.

BIGGE, a pap, or teat.

BILL, an edged tool used by husbandmen in cutting bushes, &c. It is a kind of hatchet with a hooked point, and a handle either shorter or longer, according to the various uses for which it is intended.

BIN, or BINN, a place where corn, &c. is deposited.

BIND-WEED, called by some *with-wind*, a troublesome weed, of which there are two species, the smaller and the greater.

The first, or smaller bind-weed, commonly called gravel bind-weed, is very common upon dry banks, and in gravelly ground in most parts of England, and is generally a sign of gravel lying near the surface. Its roots penetrate very deep into the ground, whence it is in some countries called devil's guts. It is a very troublesome weed both in gardens and fields.

The second or greater bind-weed, is also a troublesome weed; but in an open clear spot of ground, where the plants are constantly hoed down for three or four months, they may be effectually destroyed; for when the stalks are broken or cut, a milky juice flows out, by which the roots are soon exhausted, and decay; but as every part of the root will grow, this circumstance renders it a troublesome weed to destroy, where its roots are intermixed with those of other plants. *Miller's Gard. Dict.*

Mr. Lisle, after observing that he believes bind-weed propagates itself in pasture grounds chiefly by its seeds, and by its roots in arable land, because it seems to flower too late in corn to seed before the corn is cut, thinks the reason why it is most apt to multiply in clayey soils, is because such ground being, in the common practice, ploughed only in winter months, after wheat, for other crops as barley, pease, or oats, and not till about September for winter vetches; this tillage cannot destroy the roots or seeds of weeds like the summer fallows for wheat; but, on the contrary, promotes their increase, particularly from the off-sets, or joints of the roots. "I have known, says he, in this case, clay land folded for barley, and particularly that part of it which, waiting for the folds going over it last, was latest fallowed, bring up such an increase of with-wind, that, though the spring and summer had been very dry, every stem of barley had a with-wind round it. As the fold brought up a crop of this corn, it brought up with each plant its enemy, which would eat it out, pull it down before it could ripen, and threby prevent the filling of the grain. The crop is also greatly hazarded here, after it is cut, from the danger it must run by laying in swarth, till this weed is withered before it can be carted. Again, near the end of the first summer, after the first year of a crop of hop-clover, which I fed, that is about the beginning of August, I fallowed the ground for wheat, then dunged the fallows, and sowed the wheat before Michaelmas. I had a very good crop of wheat; but a with-weed came up to every plant; so that had it been a wet and cold summer, instead of a hot and dry one, as it chanced to be, my corn would have been pulled down and lodged while green in the ear, and in the milk, and could not then have filled in body and flour, but must have been of the nature of blighted corn. The increase of the with-wind here was, without doubt, occasioned by laying down this ground only to one summer feed after the hop-clover was sown, when it had borne three or four crops of summer corn after its wheat crop; for by the winter ploughings, as I intimated before, the off-sets of the roots of weeds, and their seeds, were propagated. I could not conveniently destroy these roots or seeds by giving the ground a seasonable summer fallow in the beginning of June; because I should then have lost the fruits of my hop-clover crop, by ploughing it in at the beginning of the first summer: though this would have contributed much to the killing of the with-wind: whereas, by delaying the fallowing three months longer, viz. to the beginning of August, when the sun had lost its strength to burn up the roots and malt the seeds, and it was too late for the ground to lie long to a fallow, the dung laid on the fallows gave new life to the roots and seeds. *Lisle's Husbandry, vol.* II. *pag.* 303.

BINN. *See* BIN.

BIRCH, the name of a tree so well known as to need no description. This tree is not much esteemed for its wood, but however it may be cultivated to advantage upon barren land, where better trees will not thrive; for there is no ground so bad, but this tree will thrive in it; for it will grow in moist springy land, or in dry gravel or sand, where there is little surface: so that upon ground which produced nothing but moss, these trees have succeeded so well, as to be fit to cut in ten years after planting, when they have been sold for near ten pounds per acre standing, and the after-produce have been considerably increased. And as many of the woods near London, which were chiefly stocked with these trees, have been of late years grubbed up, so the value of these plantations have advanced in proportion. Therefore those persons who are possessed of such poor land, cannot employ it better, than by planting it with these trees, especially as the expence of doing it is not great.

The best method to cultivate this tree, is to furnish yourself with young plants from the woods, where they naturally grow, and are generally found there in great plenty; but in places where there are no young plants to be procured near, they may be raised from seeds, which should be carefully gathered in the autumn, as soon as the scales under which they are lodged begin to open, otherwise they will soon fall out and be lost: the seeds are small, so should not be buried deep in the ground. The autumn is the best season to sow them; and in a shady situation, the plants will thrive better than when they are exposed to the full sun; for in all places where there are any large trees, their seeds fall, and the plants come up well without care; so that if the young plants are not destroyed by cattle, there is generally plenty of them, in all the woods where there are any of these trees. These wild plants should be carefully taken up, not to injure the roots. The ground where they are to be planted, will require no preparation; all that is necessary to be done, is to loosen the ground with a spade or mattock, in the places where the plants are to stand, making holes to receive their roots, covering them again when the plants are placed, closing the earth hard to their roots. If the plants are young, and have not much top, they will require no pruning; but where they have bushy heads, they should be shortened, to prevent their being shaken and displaced by the wind. When the plants have taken root, they will require no other care, but to cut down the great weeds which would over-hang the plants, being careful not to cut or injure the young trees. This need not to be repeated oftener than twice in a summer the two first years, after which time the plants will be strong enough to keep down the weeds, or at least be out of danger from them.

These may be planted any time from the middle of October, till the middle of March, when the ground is not frozen; but in dry land the autumn is the best season, and the spring for moist. The distance which they should be planted, is four feet square, that they may soon cover the ground, and by standing close they will draw each other up; for in situations where they are much exposed, if they are not pretty close, they will not thrive so well.

If the plants take kindly to the ground, they will be fit to cut in about ten years; and afterwards they may be cut every seventh or eighth year, if they are designed for the

broom-

broom-makers only; but where they are intended for hoops, they ſhould not be cut oftener than every twelfth year.

The broom-makers are conſtant cuſtomers for birch, in all places within twenty miles of London, or where it is near water-carriage: in other parts the hoop-benders are the purchaſers; but the larger trees are often bought by the turners, and the wood is uſed for making ox-yokes, and other inſtruments of huſbandry.

In ſome of the northern parts of Europe, the wood of this tree is greatly uſed for making of carriages and wheels, being hard and of long duration. In France it is generally uſed for making wooden ſhoes. It likewiſe makes very good fuel.

In ſome places theſe trees are tapped in the ſpring, and the ſap drawn out to make birch wine, which has been recommended for the ſtone and gravel, as is alſo the ſap unfermented. The bark of the birch-tree is almoſt incorruptible. In Sweden the houſes are covered with it, where it laſts many years. It frequently happens, that the wood is entirely rotten, and the bark perfectly ſound and good. *Miller's Gard. Dict.*

The beſt method of obtaining the ſap of the birch-tree for making wine, &c. is to bore a hole ſlanting upwards with a middle-ſized augre to a moderate depth in the tree, and to faſten a bottle to the orifice, by which means a large quantity of the ſap may be ſpeedily procured. Or many gallons in a day may be gathered from the boughs of the trees by cutting them off, leaving their ends fit to go into the mouths of bottles, and ſo by hanging many bottles on ſeveral boughs, the liquor will diſtill into them very plentifully.

The ſeaſon for this work is from the end of February to the end of March, whilſt the ſap riſes, and before the leaves ſhoot out from the tree; for when the ſap is forward, and the leaves begin to appear, the juice, by a long digeſtion in the branch, grows thick and coloured, which before was thin and limpid. Nor will the ſap diſtil either in the night, or in cold weather while the north and eaſt winds blow; but very well and freely, when the ſouth-weſt winds blow, or the ſun ſhines warm.

The liquor is beſt that proceeds from the branches, having had a longer time in the tree, and thereby better digeſted, and acquiring more of its flavour than if it had been extracted from the trunk. *Mortimer's Huſbandry, vol.* ii. *p.* 406.

In order to have enough of this liquor to ſet about making wine with it, many trees ſhould be tapped at the ſame time, ſo that a ſufficient quantity of ſap may be obtained in a few days; for it will not keep long, without a tendency to putrefaction. To prevent this, ſome authors adviſe ſetting that which is firſt drawn in bottles, or other proper veſſels, in the ſun, till the reſt be ready, and to put into it a hard toaſt of rye-bread cut thin, to make it ferment. But as it is neceſſary to mix with this juice either ſugar or raiſins, in order to give it a body, to enable it to undergo a regular fermentation, which alone can render it fit for keeping, and for want of which it is that this wine is ſo apt to burſt the bottles into which it is put, that firſt fermentation will certainly be found hurtful. When therefore the huſbandman has not a ſufficient number of trees to obtain ſap enough for his purpoſe in two or three days, the moſt adviſable way will be to put the ſap into very ſweet veſſels, and place them in a cool cellar; for it will keep there perfectly ſound, for a much longer time, eſpecially if it be covered with oil, or bunged up cloſe.

The proportion of ſugar may be varied according to the taſte and intention of the brewer: but, in general, a pound of ſugar is thought to be the proper allowance for a gallon of this liquor. The ſap and ſugar muſt be thoroughly united by a heat juſt ſufficient to make them boil; but the long boiling, which is generally adviſed, can anſwer no good purpoſe: on the contrary, it will render the liquor leſs diſpoſed to ferment kindly, and likewiſe deprive it of a conſiderable part of the peculiar fragrance and flavour of the tree from whence it was taken. It ſhould therefore be carefully remembered, that the ſole purpoſe of boiling this liquor is, to make a thorough diſſolution of the ſurgar in it. Some people ſubſtitute honey inſtead of ſugar; in this caſe a quart of honey is eſteemed equal to a pound of ſugar. With regard to various ſpices ordered by different writers, they muſt be left to the taſte and option of the maker.

It is generally found neceſſary in order to ferment this liquor, to put into it a little yeaſt, a bit of dough, or a thin toaſt of leavened bread; after which it is treated in all reſpects like other vinous liquors. See the articles FERMENTATION, and WINE.

It is ſaid, that in the North, where large birch and plane trees are frequent, their ſap is obtained in ſuch plenty as to be uſed for brewing, inſtead of water, and that it makes equally ſtrong beer with much leſs malt. Dr. Tong, in the Philoſophical Tranſactions, N° 46. ſays, that one buſhel of malt brewed with this liquor will make as good ale, as four buſhels with common water. He thinks the ſap of the ſycamore the beſt for brewing; becauſe it is very ſweet, and, at the ſame time, very wholeſome.

BIRD-GRASS, *or* FOWL-MEADOW-GRASS, a very excellent graſs imported from Virginia, by the late Peter Wych, Eſq; and has been cultivated with ſucceſs by Mr. Roque. The Rev. Dr. Elliot of New-England, in his Eſſays on Field-Huſbandry, tells us, that it acquired this odd name from its being brought into a piece of poor meadow at Dedham, by ducks and other wild water-fowl. We have given a figure of this valuable graſs on Plate IV. Fig. 4.

As Mr. Roque is the only perſon that has ſucceſsfully cultivated this ſpecies of graſs, we ſhall give our readers his own account of it, which he ſent in a letter to the Society for the Encouragement of Arts, &c.

"In the month of March, 1764, I received from the late Peter Wych, Eſq; the chairman of the committee of agriculture in the Society for the Encouragement of Arts, &c. an ounce and a half of the ſeed of a ſpecies of graſs called bird-graſs. He obtained it from Virginia, where it grows, though it is not a native graſs. The intention of putting it into my hands was, in order that I ſhould cultivate it, and be thence able to form a judgment whether it might have any peculiar properties not found in our graſſes, that would render it an advantageous article of culture here. He had, himſelf, conceived a very high opinion of it, by the information he had gained concerning it, from the country whence it came; and intended, as ſoon as he ſhould have due proof from experiment, of what he hoped, to bring it before the Society for the Encouragement of Arts, &c. who had, with public-ſpirited zeal, entered very minutely into the conſideration of the means of improving paſtures. Being very ſolicitous to acquit myſelf of the truſt, I carefully preſerved this little treaſure till the month of April, which I thought might be a fit time to ſow it. Not being acquainted with the particular nature of this graſs, I prepared the ground for it, in the ſame manner I ſhould have done for a flower-bed: raking it with a wooden rake. I did this as I was willing by every means to ſecure its coming up: but ſuch care would not have appeared in the leaſt neceſſary, had I known its great hardineſs, and force of vegetating power, as I have done ſince.

"At the time I expected the bird-graſs to riſe from my ſeed, I found the weeds and common graſs coming up very thick: ſo that I could not diſtinguiſh the deſired kind from theſe intruders; particularly the poa-graſs. Being a ſtranger, as I before ſaid, to the appearance of the bird-graſs, I thought it the beſt way to weed out the other graſs and herbs which I knew, and to let what I could not diſtinguiſh to be ſo, remain in the ground: and my eagerneſs was ſo great to perceive whether the bird-graſs was come up, that I went almoſt every hour to look after it. I diſcovered it at laſt, in about a month from the time of its being ſown, by its having a deeper green hue than is commonly ſeen in our graſſes: and I tranſplanted it as ſoon as I imagined it would bear moving, into ſome of the ſame kind of ground, as that on which it had been raiſed: having firſt turned it up and cleared it from weeds. The ſize of this piece of ground was about twenty rods: part of it a little gravelly, and the other part of it moory land. I ſoon perceived the bird-graſs grew better on the gravelly than on the moory part of the ground. That on the gravelly being of a better colour and ſweeter than that on the moory; which was pale and yellow. And with reſpect to the moory ground itſelf, one part was moiſter than

than the other, and the bird-grafs grew better on the drier fide than on the wet. The grafs, however, looked well all the fummer, and in the month of September following, I began to gather the feed, and proceeded in it till October. The quantity of the feed was above twelve pounds.

"The firft year the grafs did not grow to above two feet and an half high: but the fecond it rofe to be four feet high. On the 14th of June of that year, being 1765, I meafured out ten rods of this grafs, and cut it. Three days after I weighed the product of this ten rod, herb and feed together; and they amounted to twelve hundred pounds. The tenth of Auguft following, the fame grafs was again grown to the height of two feet eight inches, and was a fecond time fit to cut for hay: but I did not cut it; becaufe I wanted a fecond crop of feed: which I obtained in the beginning of October; and it proved a much greater crop than the former. About this time a good deal of rain fell, which occafioned me no fmall fhare of trouble in drying the grafs, and turning the little cocks. I then firft remarked that fhoots were made from almoft every joint, in confequence of the moifture; but from fome more than others: and of thefe many were of a finger's length. Had I not fuffered this grafs to ftand, that I might have the feed, I am fatisfied I could have mowed it thrice in the year; but wanting to collect as great a quantity as I could of the feed, I have not yet actually tried that experiment. I am very confident, however, that this kind of grafs may be brought to afford eight tons of hay per acre in the year: and any perfon who may entertain doubts of the reafonablenefs of this fuppofition, may have them cleared up by ocular proof, if they will take the trouble to call on me; as great numbers of gentlemen have already done, to their entire fatisfaction in this point. The latter end of May, and the beginning of June, will be a proper time for fuch infpection; as this grafs, being a forward kind, will be fit to cut at that feafon.

"This grafs has a peculiar quality, different from what is found in any other kind I ever knew before; which is, that it hath very fhort joints, and that every joint fends out fhoots, which ftrike root whenever they touch the ground. On taking a full-grown plant of the grafs out of the ground, it will be found, moreover, capable of being divided into twenty fmaller roots or off-fets, proper to be again planted: and thefe off-fets, though taken thus from the root, even in the beginning of July, will bear feed the fame year. If, likewife, when this grafs is ready to be mowed, there fhould happen to be much rain, no damage will enfue on waiting a month for fair weather. Becaufe, as this grafs is conftantly fending out fhoots at every joint, it always keeps frefh; and does not wither, nor root at the bottom, as other graffes do: but, on the contrary, it continues green, even till the feed is ripe: which is certainly a very fingular property, and of great confequence.

"The goodnefs of this kind of grafs may alfo be very obviously inferred from the following particular. When I firft fowed it, which was in the month of April, 1764, I had, as I have above declared, only one ounce and a half of feed: but betwixt that time and the prefent, I have found fuch a furprizing increafe, that I have collected from the fucceffive crops of this ounce and a half, as much feed as has fown two hundred and fifty acres of land; and have befides, as much by me at prefent, as will fow one hundred acres more.

"I fhall not dwell any longer on the commendation of this grafs, than only to fay, that it has every quality requifite to make good hay. That it is eafily propagated, and from a very fmall portion of feed. That it is not fubject to rot, or fail in patches, as moft other kinds of grafs do. That it is a beautiful green at all times, and confequently affords a moft pleafing verdure, when fown in fight of any houfe, or made part of any profpect. And, laftly, that the produce of hay from it is extremely great, being much more than any other kind of true grafs will yield. Of the truth of all this many perfons can witnefs, who have, on feeing the real trials refpecting it, given the greateft encomiums on it: I fhall therefore proceed now to offer fome directions for its culture.

"The ground on which the feed of this kind of grafs is intended to be fown, is to be prepared in the manner that is proper for lucern: that is, it fhould be well ploughed and harrowed; and cleared, as much as poffible, from all weeds, in the fame way as is done for barley. When the ground is well mellowed and fweetened, the feed may be fown: the quantity of which may be about one pound and a half per acre; and the time of doing it, from March to April.

"Before the bird-grafs feed be fown, it will be proper to fow as much barley or oats, as will afford half a crop: and fuch barley or oats being harrowed in, the pound and half of bird-grafs feed fhould be fown over it: after which, in general cafes, the ground is only to be rolled the firft opportunity when it is dry. But if the foil be fandy or dry, it may be proper to give it a very light harrowing.

"This kind of grafs cannot be well fown without fome corn. Becaufe it is of fo fine and delicate a nature, at its firft coming up, that the weeds would overpower and choak it at that time: or a great expence would be neceffary for clearing them away by hand. But when this grafs is fo mature, as to be in the ftate of a pafture, or fit to cut, it grows fo clofe and thick, that if a handful of money was thrown up over it, none would, when fallen, I am certain, reach the ground.

"As to the nature of the foil proper for the culture of bird-grafs, almoft every kind will do very well for it; except, as has been obferved before, fuch as is too wet or moory; and this is one of the good properties of this grafs, becaufe few kinds flourifh much on dry gravelly ground.

"This is a juft account of the obfervations and experiments I have hitherto made on this valuable grafs; and they feem fufficient to juftify me, in endeavouring to render it known to the public, as an object worthy their attention."

BIRD'S-NEST, the name of a weed otherwife called wild carrot. *See Wild* CARROT.

BISHOP, a little fpotted beetle, commonly called the lady-cow, or lady-bird.

BISHOPING, a cant term made ufe of by horfe-jockies, implying the unfair practices they make ufe of to conceal the age of an old horfe, or the ill properties of a bad one.

BIT, *or* BITT, the iron part of a bridle, put into a horfe's mouth.

BLACK, a colour in horfes, efteemed very beautiful, efpecially when they are of a jet fhining black, and well marked, without having too much white: for as a great deal of white, efpecially when it fpreads round their eyes, and a great way up their legs, adds nothing to their beauty, fo neither does it add any thing to their goodnefs. The Englifh black horfes have more white about them than the black horfes of any other country. The Spanifh, Arabian, Dutch, and Danifh horfes, feldom have much; though a ftar or blaze, and fometimes a white muzzle, and one or more of the feet tipped with white, always looks beautiful and lively, and is fo far from being a diminution of the goodnefs of a horfe, that moft think it an addition, from an opinion that horfes without marks are generally ftubborn and ill-conditioned. Some black horfes have brown muzzles, are brownifh on their flanks, and between their hips. Thefe are often called black browns, as they are not a perfect black, but approach near to the colour of a tawny black hound; fome are of a lighter colour about their muzzles, and are called mealy-mouthed horfes; and of thefe fort are the pigeon-eyed horfes, which have a white circle round their eye-lids, and their fundaments often white. Thofe that partake moft of the brown, are generally the ftrongeft in conftitution. *Gibfon on Horfes, vol.* i. *p.* 46.

BLACK-GRASS, a fpecies of grafs in America, of which the following account is given by the late Dr. Elliot of New-England.

"We have, fays that worthy writer, in a letter to Mr. Mills, an excellent fort of grafs in our falt marfhes. It thrives beft, and grows largeft, in thofe meadows which border on tide-rivers, and have the greateft mixture of frefh-water. Where the water is very falt it is not apt to fix and fpread; but will remain fhort and poor. It is very tender, and cuts as eafily as garden cives, grows thicker and taller than the common falt-marfh grafs, and affords from two to three tons of hay to the acre: but it is a flow grower, after it has been cut. Its feeds are fmall, like thofe of tobacco. The colour of this grafs is a very deep green,

green, which renders it fo confpicuoufly different from every other kind, that it is univerfally known by the name of black grafs.

"This fpecies introduced itfelf long fince the fettlement of New England. Our firft planters knew nothing of it; nor has it yet travelled very far fouth-weft. Its firft appearance in this colony was on a marfh at Saybrook, to which an old boat was brought down Connecticut river, by a great flood, and there caft up. This inclined me to think, that it was originally an inland grafs, which happened to fuit with fuch falt marfhes as are well fupplied with frefh water; and what confirms me in this opinion is, that a perfon in the town of Killingworth, where I refide, having cleared a fwamp far diftant from falt water, and afterwards fent into this frefh meadow, cattle, which had been foddered with hay of the black grafs, had there in a fhort time (undoubtedly by means of its feeds carried thither in the dung of thefe cattle) a fine growth of this very grafs, which has fince not only eftablifhed itfelf, fpread, extended, and, like a conqueror, beaten out the natural grafs; but looks as flourifhing in that frefh meadow, as any growing on a falt marfh.

"I have a large tract of peat meadow, in which no grafs feeds will grow. I defign to try the feeds of this black grafs in that dead frefh meadow, fince the other forts which I have tried do not fucceed. What encourages me to do this, is my having introduced it into a once ufelefs, worthlefs morafs, worfe indeed than nothing, though of confiderable extent, for I was obliged to be at the expence of fencing it, for the fake of other land. It was quite over-run with reeds, bufhes, and brakes.

"Between this land of mine and a creek of falt water, intervened three meadow lots belonging to other perfons. I obtained leave of the owners to cut a ditch fix feet wide through their ground, and carried this ditch to the upper end of my land, where feveral crofs ditches were then dug, to invite in, and retain the falt water. The gaping mouths of thefe numerous ditches foon occafioned a ftrong indraught of falt water, and, in time, converted the main ditch into a proper tide creek. The falt water thus introduced has done wonders. It has not only killed the trees, bufhes, brakes, and levelled great inequalities, but has alfo introduced the black grafs, and thereby rendered an acre of that land, which was not worth any thing before, now worth thirty-five pounds of our currency.

"The falt water in its paffage through my neighbours grounds has alfo done them great fervice, by introducing this black grafs; and all this with fmall expence." *Mills's Hufbandry, vol.* III. *pag.* 416.

To this account of the black grafs given by doctor Elliot, we fhall add the following, tranfmitted in a letter from that gentleman's fon-in-law, the reverend doctor Gale.

"Its (the black grafs) early fpring and growth, its lively green, its great produce, the preference given to it by cattle, when diftributed promifcuoufly with falt grafs for their food; its rendering the turf of mirey, loofe, dirty meadows, firm and folid, and its extraordinary quality when improved for pafture in the fpring and fummer, raifed its reputation, and endeavours were ufed to propagate it: but it proved very fullen and uncertain in its growth; growing only where it lifted, from the feed promifcuoufly fhed, and wafted about by the tide which overflowed the meadows.

"It is obferved to grow and flourifh well near the banks of rivers, which admit the falt water, and even in flat or low meadows, which are in fome meafure overflowed every tide by the falt water: but thefe low meadows muft alfo be of that kind only, where there is a courfe of frefh water when the tide is out: fo that a mixture of both frefh and falt water feems to be neceffary for its prolific vegetation.

"It grows largeft and beft in reedy and rufhy coves, or arms of the falt meadows, which are a little higher than the general level of the falt marfh, which are not commonly overflowed by the flux and reflux of the tides, which lie at fome diftance from falt creeks or courfes of falt water, and which are watered by frefh fprings rifing from the banks, or adjoining uplands.

"I have feen feveral fuch meadows which flourifh remarkably with this fort of grafs, though but lately brought under culture: I am credibly informed, that eight acres of fuch a cove produced this year thirty-two tons of black grafs in an adjoining townfhip.

"The black grafs is not near fo much impregnated with falt as the common grafs is, when both of them grow together; and the dew which adheres to the black grafs is frefh, when that on falt grafs is highly impregnated with falt.

"It thrives beft on a clay or ftrong loam. The natural turf fhould be broken, and the feed, after being mixed with frefh cow-dung, fhould be fpread, and faftened in by treading, that it may not be carried off by the water: or it may be propagated by tranfplanting the turf taken from a black grafs meadow, by which means it will be made to fpread a pace.

"It will alfo grow where falt water never reaches. I have feen it growing on moift upland, and the turf has been fo firm, that it was hard work for fix oxen to plough through it."

We fhall only add, that the above gentleman has juft fent the Society for the Encouragements of Arts, &c. a confiderable quantity of the feed of this black grafs; and that they have diftributed it to a number of gentlemen, in order to their fowing it on proper foils; fo that there is great reafon to hope that this valuable grafs will foon be as well known in England, as it is now in America.

BLACK-LAND, a name given to a particular fort of clayey foil, which is rather a grey than a true black. But however pale it may be when dry, it always blackens by means of rain; and when ploughed up at thofe feafons, it fticks to the plough fhare; and the more it is wrought, the muddier and dufkier coloured it appears.

Thefe forts of lands when fomewhat fat, yet porous, light, and fufficiently tenacious, are good both for corn and grafs; but as they are moftly in bottoms, fo the wetnefs of them often fpoil them for corn; but where they are dry, they are extraordinary fruitful, efpecially for barley; they will bear alfo good wheat upon an erch crop: but if they are fo very rich, that you fear lodging of the corn, you may, if a deep mould, plant them with liquorice, or fow them with hemp, woad, cole, rape-feed, madder, or fome other rich commodity, that beft agrees with fuch land; and afterwards with corn, when fome of the fertility is abated. The natural produce of thefe lands is commonly thiftles, docks, and all forts of rank weeds and grafs. It will bear excellent clover. The beft manure is chalk, lime, dung, &c. *Mortimer's Hufbandry, vol.* I. *pag.* 75.

BLACK-LEGS, a name given in Leicefterfhire to a difeafe frequent among the calves and fheep. In Staffordfhire they call it the wood-evil.

It is a white jelly, and fometimes a bloody jelly, fettling in their legs, from whence it has its name of black-legs, and often in the neck between the fkin and flefh, which will make them carry their necks awry. If it falls on the joints they overcome it; but of in their bowels they die, nor is there any cure. *Lifle's Hufbandry, vol.* II. *pag.* 134.

BLACK OATS, a fpecies of oats greatly cultivated in the northern parts of England, being efteemed a very hearty food for horfes. *See the article* OATS.

BLACK THORN, a fpecies of bufhes well known, and much ufed in making fences, &c.

It is not reckoned quite fo good for fences as the white thorn, becaufe it is apt to run more into the ground, and is not fo certain of growing; but then the bufhes are much the beft, and moft lafting of any for dead hedges, or to mend gaps: nor are cattle fo apt to crop them as the other. They will grow on the fame fort of foil with the white thorn; but the richer the mould is, the more they will profper. *Mortimer's Hufbandry, vol.* I. *pag.* 5.

BLADE, the fpire of grafs, or green fhoots of corn.

BLADE, alfo fignifies the fharp or ftriking part of a weapon or inftrument.

BLAIN, a difeafe to which cattle are fubject in the fpring of the year. Some think it is occafioned by a little red worm which the cattle lick up. It often occafions a bladder as large as a hen's egg under the tongue, and when this happens, the beaft may be cured by breaking the bladder, and rubbing it with falt.

Others impute the difeafe to a fudden rifing of the blood, and may be known by the beaft's eyes running with water; and as the diftemper advances, its eyes will fwell, and, if bled under the rump, the blood will feel hot. In this cafe the following drench is recommended. Take a pennyworth of Englifh liquorice, and an equal quantity of Englifh anifeeds, turmeric, long pepper, horfe-fpice or diapente, all ground fine, and juft boiled up in a quart of ftrong beer; but if the heat of the blood indicates that the diftemper proceeds from a hot caufe, the horfe-fpice fhould be omitted. It is added, that if the bladder cannot be found under the tongue, the bum-gut fhould be raked, where it will be found in the back. If a knife be run through the ear of a beaft near the root, it will, according to the report of experienced graziers, prove a certain cure in this diftemper, provided it be done before the beaft falls. *Lifle's Hufbandry, vol.* II. *pag.* 127.

BLANCHING, an operation performed on certain fallets, roots, &c. fuch as cellery and endives, to render them fairer and fitter for the table.

One method of blanching confifts in tying the leaves up clofe; this is practifed on cabbages, lettuces, &c. in the fummer, which makes them fit for ufe confiderably fooner, and particularly thofe which are not inclinable to turn in, or cabbage, as the gardeners call it. Another method practifed in winter on celery, endive, dandelion, &c. is by earthing them up to their tops, which not only b anches, but alfo protects them from the frofts.

BLAST, the fame with blight. *See* BLIGHT.

BLAZE, a white mark in a horfe's face.

BLEA, that part of a tree which lies immediately under the bark, or between that and the hard wood, and is the firft progrefs of the alteration of the bark into wood, by the natural growth, and ftrengthening of the fibres.

While the blea remains any thing foft, and retains fomewhat of the nature of bark, it may maintain a feeble vegetation; but when it is grown abfolutely hard and woody, it can no longer contribute to carry on that operation.

BLEEDING, an operation frequently neceffary among all kinds of cattle, particularly horfes; and confifts in opening a vein by means of an inftrument called a fleam.

Thofe horfes that ftand much in the ftable, and are full fed, require bleeding more than thofe that are in conftant exercife; but efpecially when their eyes look heavy and dull, red and inflamed; or when they look yellow or inflamed in their lips, and infides of their mouths; when they feem hotter than ufual, and mangle their hay. Thefe are all indications that require bleeding, and likewife to lower their diet till they have more exercife.

Young horfes fhould be bled when they are fhedding their teeth, which is a relief to them, and removes thofe feverifh heats, to which they are fubject at that time.

The fpring is always a proper feafon for bleeding, becaufe their blood is then more luxuriant than at other times; and in fummer it is often neceffary to prevent fevers, always choofing the cool of the morning, and keeping them cool the remaining part of the day.

Some bleed their horfes three or four times a year, or even oftener, by way of prevention. Thefe take a very fmall quantity at a time, not exceeding a pint, or a pint and a half, only to give a kind of brifker motion to the blood, and by that means to preferve or render it more thin and fluid, and to prevent its ftagnating in the fmaller veffels, which indeed is the firft beginning of almoft all difeafes; but how far this fucceeds, can only be known to thofe who have practifed it a fufficient time. There is, however, this inconvenience from frequent bleeding, that it grows into a habit, which, in fome cafes, cannot be eafily broken off without hazard; and fome horfes have been known to become weak from frequent bleeding, while others have had their necks fo full of fcars, that they are apt to inflame and fefter every time they are bled, which is always troublefome, and often ends with the lofs of the vein. And therefore to prevent fuch accidents, thofe who bleed horfes fhould not confine their operation to one place of the vein, as they generally do, but ufe themfelves to open it higher or lower as they fee occafion; and if they meet with any difficulty in bleeding in the neck veins, the plate veins, or any other large veins, that can be made to run a full ftream, will equally anfwer the fame end.

But the cafes that require bleeding moft, are colds, fevers of almoft all kinds, falls, and bruifes, which are fometimes dangerous to horfes, becaufe of their great weight. Hurts and wounds of the eyes, ftrains in hard riding, or drawing, and all other accidents where a ftagnation of the blood may be fuddenly expected, or where the fmall veffels may be broke, and the blood extravafated. Thofe horfes that refufe their food after riding, or any fort of work, require to be bled more frequently than others, to prevent fevers, and inward inflammations of the lungs, the liver, or any of the principal vifcera. Nor is it lefs neceffary to bleed horfes at grafs, when the purgation is over, and they begin to gather flefh, or at any other time, when they look heavy about their eyes, for that is a proper indication for bleeding; and fome rank paftures require more bleeding than others.

There are alfo other indications that require bleeding by way of prevention, viz. when any epidemic diftemper prevails among the horfes; at fuch times the found ones may be bled, to keep them, if poffible, from being infected; and if the contagion continues, it may not be amifs to repeat the bleeding once in two or three months, or oftener; but in fmall quantities, for the lofs of too much blood may be hurtful in fome times of contagion. It is likewife neceffary to keep found horfes from the unfound, or to remove them into places where the infection has never fpread itfelf. *Gibfon on the Difeafes of Horfes, vol.* I. *pag.* 218.

BLEYME, an inflammation in an horfe's foot, occafioned by blood putrified in the inner part of the coffin towards the heel, between the fole and the coffin-bone.

There are three forts of bleymes; the firft, bred in fpoiled, wrinkled feet with narrow heels, are ufually feated in the inward or weakeft quarter: the fecond, befides the ufual fymptoms of the firft, infects the griftle, and muft be extirpated, as in the cure of a quitter-bone. *See* QUITTER-BONE. The third is occafioned by fmall ftones, or gravel, between the fhoe and the fole. For the cure they pare the foot, let out the matter, if any, and drefs the fore like the prick of a nail.

BLIGHT, a general name for various diftempers incident both to corn and fruit-trees.

M. du Hamel treats that part of this fubject which relates to corn in a very mafterly and inftructive manner; dividing what we generally call blights into the following fpecies, viz. empty ears, parched and fhrivelled corn, glazed corn, abortive or rickety corn, barren corn, and fallen or lodged corn. The reader will find each under its proper articles, as EMPTY EARS, &c.

"There is nothing, fays Mr. Miller, fo deftructive to a fruit-garden as blights; nor is there any thing in the bufinefs of gardening which requires more of our ferious attention, than the endeavouring to prevent or guard againft this great enemy of gardens.

"In order, therefore, to remedy this evil, it will be neceffary firft to underftand the true caufes of blights: and, although many curious perfons have attempted to explain the caufes of them, yet very few of them have yet come near the truth, except the reverend and learned doctor Hales, who hath, in his curious book, intitled, Vegetable Statics, given us fome accurate experiments upon the growth and perfpiration of plants; together with the various effects the air has upon vegetables; fo that, by carefully attending thereto, together with diligent obfervations, we need feldom be at a lofs how to account for the caufes of blights, whenever they may happen.

"Blights are often caufed by a continued eafterly wind, for feveral days together, without the intervention

tion of showers, or any morning dew, by which the perspiration of the tender blossoms is stopped; so that, in a short time, their colour is changed, and they wither and decay: and if it so happens, that there is a long continuance of the same weather, it equally affects the tender leaves; for their perspiring matter is hereby thickened, and rendered glutinous, closely adhering to the surfaces of the leaves, and becomes a proper nutriment to those small insects, which are always found preying upon the leaves and tender branches of fruit-trees, whenever this blight happens.

"The best remedy for this distemper, that I have yet known to succeed is gently to wash and sprinkle over the trees, from time to time, with common water (that is, such as hath not had any thing steeped in it) and the sooner this is performed (whenever we apprehend danger) the better; and, if the young and tender shoots seem to be much infected, wash them with a woollen cloth, so as to clear them, if possible, from all this glutinous matter, that their respiration and perspiration may not be obstructed; and if we place some broad flat pans or tubs of water near the trees, that the vapours exhaled from it may be received by the trees, it will keep their tender parts in a ductile state, and greatly help them; but, whenever this operation of washing the trees is performed, it should be early in the day, that the moisture may be exhaled before the cold of the night comes on; especially if the nights are frosty: nor should it be done when the sun shines very hot upon the wall, which would be subject to scorch up the tender blossoms.

"Another cause of blights in the spring is, sharp hoary frosts, which are often succeeded by hot sunshine in the day-time; which is the most sudden and certain destroyer of fruits that is known: for the cold of the night starves the tender parts of the blossoms, and the sun rising sun hot upon the walls before the moisture is dried from the blossoms (which, being in small globules, collects the rays of the sun) a scalding heat is thereby acquired, which scorches the tender flowers, and other parts of plants.

"But there is another sort of blight, against which it is very difficult to guard our fruit-trees; this is sharp pinching frosty mornings, which often happen at the time when the trees are in flower, or while the fruit is very young, and occasion the blossoms or fruit to drop off; and, sometimes, the tender parts of the shoots and leaves are greatly injured thereby.

"The only method yet found out to prevent this mischief is by carefully covering the walls, either with mats, canvas, reeds, &c. which being fastened so as not to be disturbed with the wind, and suffered to remain on during the night, by taking them off every day, if the weather permits, is the best and surest method that hath yet been used in this case; which, although it has been slighted, and thought of little service by some, yet the reason of their being not so serviceable, as has been expected, was, because they have not been rightly used, by suffering the trees to remain too long covered; by which means, the younger branches and leaves have been rendered too weak to endure the open air, when they are exposed to it; which has often proved of worse consequence to trees, than if they had remained entirely uncovered.

"Whereas, when the covering before-mentioned has been performed, as it ought to be, it has proved very serviceable to fruits; and many times, when there has been almost a general destruction of fruits, in the neighbouring gardens, there has been a plenty of them in such places where they have been covered; and, though it may to some seem very great trouble, yet, if these coverings are fixed near the upper part of the wall, and are fastened to pullies, so as to be drawn up, or let down, it will be soon and easily done; and the success will sufficiently pay the trouble.

But there is another sort of blight, that sometimes comes later in the spring, viz. in April or May, which is often very destructive to orchards, and open plantations, and against which we know no remedy. This is what is called a fire-blast, which, in a few hours, hath not only destroyed the fruit and leaves, but many times parts of trees, and, sometimes, whole ones have been killed by it.

"This is supposed to effected by volumes of transparent flying vapours, which, among many forms they revolve into, may sometimes approach so near to a hemisphere, or hemi-cylinder, either in their upper or lower surfaces, as thereby to make the beams of the sun converge enough to scorch the plants or trees they fall upon, in proportion to the greater or less convergency of the sun's rays.

"The learned Boerhaave, in his Theory of Chemistry, observes, that those white clouds, which appear in summer time, are, as it were, so many mirrors, and occasion excessive heat; these mirrors are sometimes round, sometimes concave, polygonous, &c. and therefore when the face of the heavens is covered with such white clouds, the sun, shining among them, must of necessity produce a vehemen heat; since many of his rays, which would otherwise, perhaps, never touch our earth, are by that means reflected to us: thus, if the sun be on one side, and the clouds on the opposite, they will be perfectly burning glasses.

"I have sometimes, continues he, observed a kind of hollow clouds, full of hail and snow in this position; during the continuance of which, the heat was extreme; since by such condensation they were enabled to reflect more strongly: after this came a sharp cold, and then the clouds discharged their hail in great quantities; to which succeeded a moderate warmth. Frozen concave clouds therefore, by this great reflection, produce a vigorous heat; and the same, when resolved, excessive cold. Whence, as doctor Hales observes, we see, that blasts may be occasioned by the reflections of the clouds, as well as by the above-mentioned refraction of dense transparent vapours.

"Against this enemy to fruits, &c. as has been already observed, there is no guard to our plantations, nor any remedy to cure it: but as this more frequently happens in close plantations (where the stagnating vapours from the earth, and the plentiful perspiration from the trees, are pent in for want of a free air to dissipate and dispel them; which are often observed, in still weather, to ascend in so plentiful a manner, as to be seen by the naked eye; but especially with a reflecting telescope, so as to make a clear and distinct object become dim and tremulous) than in those which are planted at a greater distance, or are not surrounded with hills or woods; this directs us in the first planting of orchards, &c. that we should allow a greater distance between the trees; and make choice of clear healthy situations, that the air may freely pass between the trees, to dissipate those vapours before they are formed into such volumes, whereby the circumambient air will be clear, and less subject to injuries: as also the fruits, which are produced in this clearer air, will be much better tasted than those that are surrounded with a thick rancid air; for, as fruits are often in a respiring state, so they, consequently, by imbibing a part of these vapours, are rendered crude, and ill tasted; which is often the case with a great part of our fruits in England. *Miller's Gard. Dict.*

BLIND, deprived of the sense of sight.

Moon-BLIND, or *lunatic*, a disease to which horses are subject, the symptoms of which are no other than the forerunners of cataracts, and generally end in blindness.

Signior Ruini, says that experienced writer Mr. Gibson, and most other foreign writers, both French and Italia, in treating the diseases of horses, have all of them reckoned the moon-blind symptoms as a peculiar disease of the eyes, without having any relation to a cataract, which they have considered a-part, as another disease of the eyes, which shews they built more on books than experience. But from many years observation, I do not remember I have ever seen a cataract bred in the eyes of any other horses than those which were called lunatic, or moon-blind. The Arabians were the first that ascribed so much to the moon in the diseases of the human body; and after the decay of learning all over Europe, their superstitious notions were so firmly riveted, and so universally prevailed, that they could not be easily exploded, even by the ablest physicians, till the modern discoveries in natural knowledge

ledge made way for more solid improvements in the medicinal art; and therefore it is no wonder, that the first writers on the subject of farriery, notwithstanding some of them were men of learning, should fall in with all the common superstitions that had so long prevailed, and had so great an influence on the practice of physic.

These writers have described this distemper as appearing at certain times of the moon, coming sometimes at the new-moon; sometimes at the full; and sometimes in the wane of the moon; that it sometimes returns once in three months; sometimes once in two months, and in some not above once in six months: that the eyes look so clear when the distemper abates, that it is impossible to see any imperfection in them. But these observations are very liable to exception; for any one who has the least knowledge of the eyes, must needs see, that when the distemper is the most abated, and the eye the most clear, it still shews a remarkable weakness, and upon full trial, the sight will be found defective. Neither could I perceive that the eyes were affected by any of the moon's periods, so as not to vary, unless by mere accident. And therefore these observations are neither of any great use to the knowledge of the distemper, nor to lead us into a right method of curing it when it happens.

I have already taken notice, that the symptoms which appear in the moon-blind horses, are, for the most part, no other than the prognostics of breeding cataracts. These symptoms generally make their first appearance, when a horse is turned five, coming six, at which time one eye becomes clouded, the eye-lids swoln, and very often shut up; and, for the most part, a thin viscid water runs, from the diseased eye, down the cheek, which is generally more or less in proportion, as the eye and eye-lids happen to be more or less swelled and inflamed; and in some constitutions, the inflammation is so great, and the humour so sharp and corrosive, that it scalds and fetches off the hair wherever it comes. The veins of the temples and under the eye, along the side of the nose, are also turgid and full: others run but little; nor is the humour very sharp.

This disorder is apt to come and go, till the cataracts are perfect and ripe, and then all pain and anguish, and the soreness and running of the eyes, go off with blindness, when the horse is between seven and eight years old, this being about the time when most horses are spread and come to their full growth; so that from its first appearance to its completion, is generally about two years, or two years and a half, during which time, some horses have the returns of the disorder, not only more frequently than others, but the symptoms also are more strong and violent. In some the eye is not much disturbed above a week, when it clears up again, and returns to its former state. In some horses the eye continues bad a fortnight or three weeks. In others a month or longer, before the disorder goes off; and the time of the return, so far as I could observe in many horses, was always uncertain, and could not be fixed to any period of the moon, as many have imagined, being sometimes sooner, sometimes later, according to its predominancy, or according to the treatment a horse meets with from his farrier and keeper. Some have their returns once within the space of two or three months; some within the space of four; and, with the greatest care and pains, the disorder seldom keeps off above five months, without a relapse.

This is usually the case of those moon-blind horses, which have their eyes strongly infected with a hot sharp humour, that shuts them up with swelling and inflammation. But there is another kind of moon-blindness, which is also the fore-runners of cataracts, where no humour or weeping attends the eye. It is never shut up or closed, as in the case above described, but will now and then look thick and troubled, at which time the horse sees little, and, perhaps, nothing distinctly. Here the eyes always appear sunk and perishing, though the cataracts do not become so soon complete, as in those that are full, and where a humour is predominant; nor is it unusual in this case for one eye to escape, whereby a horse will retain sight to guide him, so as to render him fit for common drudgery.

The causes of this distemper are various, and when it proceeds from a natural defect in the eyes, it may no doubt be hereditary; but in a horse that has naturally good eyes, and yet turns moon-blind, it is usually owing to sickness, or some other malady that has terminated in the eyes; though we seldom see horses turn moon-blind and breed cataracts, but where the eyes are naturally in fault. These eyes are, for the most part, faulty, that are very large and prominent, or very flat, small, and sunk; both which defects in the eyes of horses are liable to blindness, though they differ in their manner; and therefore colts, that have large eyes, that run abroad, always feed with their heads downwards, and are continually exposed to the sun in hot weather, may easily contract an habitual weakness in their eyes, especially as the blood and juices of all young animals are naturally of a viscid and balsamic texture, and thence may be the more easily retarded in the vessels of the eye, which are exquisitely fine. These causes produce weakness and relaxation in the eyes, and this still increases till the blood is in that state, which we may reasonably suppose to continue till a horse has done spreading, and turned seven, for then the cataracts generally grow complete. On the other hand, when the eyes are flat, and lie deep within their orbits, the surface of the eye being also flattish, the rays of light falling directly upon the pupil, and these not being sufficiently refracted, as they are in those eyes that are more convex, or of a rounder make, must needs weaken the eye, affect the optic-nerve, and consequently weaken the tone of the muscles. And, perhaps, this may be the reason why the eyes perish and decay, while the cataracts are growing.

The signs of this distemper may, in some measure, be deduced from what has been already observed; viz. swelling and inflammation of the eyes alternately, sometimes one eye, and sometimes the other, with a running of a thin watery serum, which is often so hot and scalding, as to fret off the hair. In others the eyes run but little, and some not at all; but look deadish, sunk, and perishing. In all moon-blind horses, the eyes are sometimes tolerably clear, at other times thick and muddy, of a wheyish colour, or a dusky yellow; and when this happens, a moon-blind horse sees but little, and when he is brought out into the light, he takes little notice of any person or object that is near him, but always looks upwards, with his head raised, lifts his feet high, and sets them down with fear. Though in this distemper the humour shifts from one eye to the other by turns, and at some intervals seems to go off, yet when the eyes of such horses are at their best, they look weak, and with a deadness, and when any such horse has his head held up, the weakness of the muscles, and of the whole eye, is easily perceived.

When this distemper happen to horses that have large full eyes, resembling those of a calf, and when the humour continues by long periods, and the returns are frequent, there is great danger of blindness. If the eyes be of a moderate size, well formed, and the periods or returns of the distemper short; if the horse sees perfectly when the humour goes off, and the eyes in those intervals look clear, the horse may recover. When the humour attacks one eye without changing to the other, there is also hopes of a cure, at least, of saving one eye. But when the eyes look flat and depressed, and decay gradually, it is generally the fore-runner of blindness; for in this case the nerves and muscles of the eyes are affected, and the cataracts always grow in the progress of the distemper. Here, however, as in the preceding case, when the distemper seizes only one eye, the other may be sometimes saved, and when this happens, the remaining eye generally grows stronger when its fellow is gone. But when the distemper proceeds from a violent cold, as sometimes happens, whereby we often see the eyes swoln, and quite shut up, though the horse may be threatened with blindness by several returns, yet by good management it may sometimes be prevented, and the eyes recover. Nor does the distemper always prove incurable, when the eyes are darkened with a yellow cloud, provided the eye be not naturally bad, and the above symptom of long continuance. In all cases of moon-blindness, the most promising signs of a recovery are when the attacks come more seldom, and their continuance grows shorter: or when the inflammation and swelling in those eyes that are naturally full and large abates. Also, when the eyes, that looked sunk and perishing, grow more plump and full;

and

and when in either the cornea looks clear and tranfparent, without muddinefs, and the horfe looks more attentive to his way, and goes on without much fear or ftartling; all thefe are promifing figns, and with good and careful management he may recover.

The moft difficult part ftill remains to be treated of, namely, the method of curing this diforder, for few moon-blind horfes efcape; and when it is hereditary, or the eyes naturally defective, it is not advifable for any one to be at much expence and trouble to fave them, as there is great reafon to fear he will meet with a difappointment. We, however, fometimes fee moon-blind horfes, at leaft fuch as have many of the fame fymptoms, recover and do well, even beyond expectation.

If the eyes are large, full, fwoln, and inflamed, the horfe fhould be bled at proper intervals; fometimes in the neck, and fometimes backward, to make a revulfion. But where the eyes appear funk or perifhing, bleeding is often pernicious. After bleeding, for thofe that are full and run a thin fharp water, make a ftrong tincture of rofes in the following manner:

> Take two drams of red rofe-buds, either frefh or dried, infufe them in half a pint of boiling water in the manner of making tea; when it has ftood to be cold, pour off the infufion, which will be of a reddifh colour.

In four ounces of this tincture diffolve half a dram of fugar of lead, and wafh the horfe's eyes, and all over his eye-lids, with a piece of fponge, or a clean bit of rag, twice a day. If the matter digeft and thicken, which ufually happens before it abates, add to the whole quantity of this tincture about two drams of honey (which will diffolve in the fluid, by holding the phial near the fire, and fhaking it) and ufe it as before. At the fame time, if the parts near the eye be hot, and the veins over the face, and along the fide of the nofe be turged and full, bathe thofe parts frequently with the beft vinegar, verjuice, or vinegar of rofes, till the heat and running of the eye abates, the veins fink, and become lefs apparent, and the eye begins to look clear. In the mean time fome lenient mild purges may be adminiftered, fuch as the following:

> Take lenitive electuary and cream of tartar, of each four ounces; fyrup of the juice of buckthorn berries, two ounces; mix thefe with white wine and water, warmed, about a pint, and give it fafting. Or,

> Take lenitive electuary and cream of tartar, of each four ounces; Glauber's purging falts, three ounces; the folutive fyrup of rofes, two ounces; to be mixed with white wine and water, or warm water-gruel.

Either of thefe may be given to moon-blind horfes. The latter is rather the more mild and cooling, and exceeding proper if the horfe be fat and full of blood, and will work fo gently, that it may be repeated twice a week, till the eye becomes clear, and attains its ufual brightnefs.

The horfe fhould have feeds of fcalded bran while thefe lenitives are given him, and he may have moderate exercife, or may be made ufe of in any kind of eafy bufinefs; for thefe draughts, for the moft part, work off in about two hours. But as the blood in all thefe cafes is generally fizy, and as this difpofes young horfes to frequent returns of the diftemper, it is, therefore, neceffary to adminifter fuch things as may attenuate the juices and preferve them in a more fluid ftate. Thefe are called alteratives, becaufe their property is gradually to alter the ftate of the blood. The following has been often ufed, in this and many other cafes, with great fuccefs:

> Take the fineft fuccotrine aloes, half an ounce, or fix drams; cream of tartar, half an ounce; frefh jallap, in fine powder, and falt of tartar, of each one dram; make the whole into a ball, with a fufficient quantity of oil of amber, and roll it in liquorice powder.

One of thefe balls may be given every week, in the manner of a common purge, with fcalded bran, and his water milk warm. The firft day it will work plentifully by urine, and the day following both ways; but no more than juft to empty his guts, unlefs when there is a foulnefs, by reafon of a redundant flime and greafe; when it will often work very powerfully two or three days, without the leaft diminution of the horfe's ftrength, or lofs of flefh. Thefe alterative purges fhould be continued for a month or fix weeks, and after omitting another month to begin again; in all which time the horfe may be kept in any common bufinefs, except hunting, going journies, or any other laborious exercife.

In the intervals between the purges it will be proper to give him an ounce of crude antimony every day, made into a fine impalpable powder, in one of his feeds, which may be continued for three months or longer. But if the horfe be of value, inftead of crude antimony, he may have powders compounded of native cinnabar, or cinnabar of antimony, and gum guiacum, equal parts, giving him an ounce every day, till he has taken two or three pounds; and after an interval of about three months, to proceed in the fame method till the eyes look ftrong and clear, and the horfe fhews no figns of blindnefs, or any defect in his fight or weaknefs in his eyes. Several gentlemen have followed this method with good fuccefs, where the eyes have been full, and no way perifhed. A pound of guiacum wood boiled in three gallons of water till it is reduced to two, is a cheap remedy, and may be profitably adminiftered to horfes of fmall value. It promotes perfpiration, dries up fuperfluous humidity, ftrengthens the folids when relaxed, and fweetens the blood. It may be given a quart or two every day, in a horfe's water, and will have a good effect to prevent moon-blindnefs, where it is not hereditary, nor proceeds from a natural defect in the eye.

But when the eyes are funk and perifhing, and the eye-brows are pinched at their inner corners next the nofe; when there is little or no inflammation or running, except a more than ordinary moifture in the caruncle, or haw of the eye, or where there is no moifture at all, as we often find in many moon-blind horfes: wherever thefe fymptoms are, a method of cure is required quite different from the preceding. For as we fuppofe here the nerves of the eye to be affected, and the fupplies of the arterial blood by that means denied; therefore, wherever the fault may be, whether originally in the blood or in the nerves, it is neceffary, in either cafe, to adminifter fuch things as not only attenuate the blood, but may caufe a greater derivation thereof to the eye: fo that the moft likely way to fucceed is by the proper ufe of mercurials; and thefe fuch as are the moft efficacious, and at the fame time the moft fafe. But firft of all let the horfe have the laft mentioned purge given him by way of preparation, and when the operation is over, which will be mild and gentle, the following ball may fucceed:

> Take mercurius dulcis that has been often fublimed and dulcified, two drams; make it into a fmall ball, with a fufficient quantity of conferve of red rofes, and wheat flour.

Let this ball be given early in the morning fafting, and tie up the horfe from eating two or three hours after it; then let him have a feed of fcalded bran, with warm water, or warm gruel to drink; which regimen ought to be continued the whole time he is under this courfe of mercurial and purging phyfic; cold water and other cold drinkables, being fomewhat unfafe at fuch a time. The mercurial ball may be repeated every other day, in the morning, till the horfe has taken three or four. If his mouth grows tender, which may poffibly happen, if he be not of a pretty ftrong conftitution, he muft be fed with water gruel for two or three days, till that fymptom wears off. At the fame time the purge may be repeated once or twice, and the following eye-water applied outwardly to both his eyes, if both be weak and difordered:

> Take crude fal ammoniac, cleaned from the black fcurf that is ufual on the outfides of the cakes, two drams; diffolve it in a pint of warm water, or the above tincture of rofes; and add to it a

gill of spirit of wine, or the best brandy, shaking them together in a quart bottle.

The eyes may be bathed all over with this mixture, twice a day, or it may be used in the manner of a fomentation, by wringing cloths out of it, and applying them warm over the eyes. This will act as a stimulus, and may also help to thin and rarify the gummy juices, and bring new supplies of nourishment to the perishing eyes. At first it may cause a little smarting; but after using it a day or two that symptom goes off, and if the eyes grow more plump and full, there will be hopes of a recovery, at least of saving one eye; and therefore the best way upon this prospect is to proceed in the same method, after a month's interval, and so on, as you find encouragement. And in all the intervals, the powders mentioned above, should be given in all his feeds, or the decoction of guiacum in his water.

Some take up the eye-veins to prevent blindness, but without distinction, whether the eyes are full with redundant humours, or sunk and perishing. In the latter case the taking up the veins may possibly be of service, because by that means the eyes may be better supplied with its proper nutritive juices; but this too is uncertain, because the fault may be in the nerves, or the distemper may proceed from some original configuration of the eye, which may be defective, and then such operations are like to prove fruitless. But the taking up the veins where the eyes are full, must, for the most part, prove hurtful, by cutting the channels which should convey the blood juices from thence in the course of circulation, and consequently increase the distemper, instead of abating it. In this case the taking up the arteries might be of some service; but this is an operation that only persons well skilled in the anatomy of a horse, should presume to undertake, and in the end might perhaps be uncertain.

The cutting out the haw is another operation usually performed on moon-blind horses. The haw is a swelling and spunginess of the caruncle or fleshy substance in the inner corner of the eye next the nose, and when it is soaked with too much moisture and humidity it swells and turns spongy. The membrane to which it adheres also grows thick, and spreads itself so as to cover a considerable part of the eye, but seldom reaches so far as to cover any part of the pupil. The ligament which runs along the verge of this membrane becomes horny; and when it rises to this state, it compresses the eye-ball like a hoop, and by its continual pressure causes constant pain, and increases all those bad symptoms that are the fore-runners of blindness. Haws grow sometimes in eyes that are not naturally bad, after colds and surfeits; but moon-blind horses are seldom without them; and wherever this symptom appears, that the haws grow large and spongy, and derive a drain of humours upon the eye, the operation becomes necessary, and is performed by taking hold of the membrane with a small hook, and cutting off so much of the caruncle as looks moist and spongy, with part of the membrane and gristle that cause a pressure on the eye. When this operation is well performed, it does great service, and often recovers horses that are not subject to cataracts; and even in this case it makes the eyes look something better, and helps to protract the blindness, but will not prevent it when it is hereditary. This is an easy operation, and what almost every farrier pretends to; but they are apt to cut off too much of this substance, and by that means weaken the eye, and forward the blindness, instead of preventing it. The proper application after cutting out the haw, is honey of roses, or rather tincture of roses, with a little honey dissolved in it. But if the eye continue still to abound with moisture, after the haw is extirpated, and threatens a fresh fungus, the case may be deemed bad; and then it will be necessary to blow into it a small quantity of burnt alum and fine loaf sugar, equal parts, once or twice a day; or one part of white vitriol, and two parts of sugar; and in some cases it may be touched with the blue vitriol-stone, or the lunar caustic; but these violent symptoms seldom happen, and when they do, we may suppose the blood to have a very bad disposition; so that it will be hardly worth while to attempt a cure, considering both the length of time, and the uncertainty of success. *Gibson on the Diseases of Horses, vol.* I. *pag.* 326.

BLINDNESS, a want of sight. The sheep in some parts of Wiltshire are troubled with a blindness, and are cured by anointing their eyes with goose dung. *Lisle's Husbandry, vol.* II. *pag.* 212.

BLISTERING *ointment*, a name given by farriers for a sort of charge or plaster for raising a blister in horses. There are various prescriptions for making this ointment, but the following is equal to any yet known:

> Take nerve and marshmallow ointment, of each two ounces; quicksilver one ounce, thoroughly broke with an ounce of Venice turpentine; Spanish flies powdered, a dram and a half; sublimate one dram; oil of origanum, two drams.

BLITHE, gay, airy, frolicksome, chearful.

BLOOD, a red liquor circulating through the veins, arteries, and other vessels of animal bodies; and serving for the support of life, and nourishment of all their parts.

Blood is an excellent manure for almost any sort of soil. Mr. Evelyn tells us, "that after the battle of Bagnam fields, in Devonshire (where lord Hopton obtained a signal victory) the blood of the slain fertilized the land, which had been sown with corn a little while before, to such a degree, that most of the wheat stalks of the ensuing crop bore two, three, four, nay seven, and some even fourteen ears; a thing almost incredible. The owner of the land seeing how miserably it had been trodden down, thought of resowing it; but was dissuaded from that design (perhaps to make the experiment) and had the above-mentioned surprizing crop." The husbandman should, therefore, be careful to procure the offals of the shambles, where they are to be had, as they will prove an excellent manure.

Blood-*letting*. *See the article* Bleeding.

Blood-*spavin*, a swelling and dilatation of the vein that runs along the inside of the hock, forming a little soft swelling in the hollow part, and is often attended with a weakness and lameness of the hock.

The cure should be first attempted by bathing the part twice a day with vinegar or verjuice; or let it be fomented with a decoction of oak bark, pomegranate, and alum, boiled in verjuice, binding over it, with a roller, a woollen cloth soaked in the same, which will contribute greatly to strengthen all weaknesses of the joints, and, if early applied, will frequently remove the disorder: but if by these means the vein is not reduced to its usual dimensions, the skin should be opened, and the vein tied with a crooked needle and waxed thread passed underneath it, both above and below the swelling, and the turgid part suffered to digest away with the ligatures: for this purpose the wound may be daily dressed with turpentine, honey, and spirit of wine, incorporated together. *Bartlet's Farriery, pag.* 279.

BLOSSOM, a general name for the flower of plants, but more especially of fruit-trees.

Blossom, or *peach coloured horse*, is one that has white hairs intermixed all over with sorrel and bay hairs.

BLOWING *of a flower*, an artificial process, in order to bring a flower to display itself with greater perfection and beauty than it would arrive at in the natural way of blowing.

The usual method for carnations is this: about April, when the flower stems begin to put forth, or spindle, as the gardeners call it, they place by each flower a strait stick, about four feet long, and tie the spindles to it as they shoot. As soon as the flower-buds appear, they displace all, except the largest, leaving only one on each flower-stem to blossom. About ten days before the flowers open themselves, the round-podded kinds will begin to crack their husks on one side; when the careful gardener, with a fine needle, splits or opens the husk on the side opposite to the natural fraction; and about three or four days before the complete opening of the flower, cuts off, with a pair of sciffars, the points on the top of the flower-pod, and supplies the vacancies or openings on each side the husk, with two small pieces of vellum, or oil-cloth, slipped in between the flower-leaves on the infide of the hufk; by this means the bloffom will difplay its parts eqally on all fides, and be of a regular figure. Befides this caution, when the bloffom begins to fhew its colours, they take care to fhade it from the extreme heat of the fun with a fmall board, or other device, faftened to the ftick which fupports it; for flowers as well as fruits, grow larger in the fhade, and ripen and decay fooneft in the fun. *Bradley's new Improvement in Gardening*, &c.

BLOW-MILK, fkimmed, or floten milk; that from whence the cream is blown off.

BLOWN, fwelled or hoved. *See the article* HOVED.

BLUE-BALL, a name given to the cone-wheat in Somerfetfhire, from the dark colour on the edge of the hufks of the chaff, which cover each grain, and the falling off of the awms when ripe; fome of the ears having awms, and others none. *See the article* CONE-WHEAT.

BLUE-BOTTLE, *knapweed*, *matfellon*, or *centaury*, the name of a weed abounding in many corn lands, flowering in July, and ripening its feeds in autumn.

Mr. Miller fays the corn blue-bottle is an annual plant; but Mr. Ray and Mr. Lifle think its root is perennial; becaufe, as the latter obferves, it not only puts forth new buds every fummer at the root for the growth of the next year, but feems alfo not to feed early enough, before the corn is cut to propagate itfelf by its feed in corn lands, in which it moft abounds, efpecially in a gravelly foil.

BLYME, the fame with bleyme. *See* BLEYME.

BOAR, the male fwine. *See the article* HOG.

BODY *of a horfe*, the material part or fubftance of a horfe, ufually called his carcafe. *See the article* CARCASE.

BOG, properly fignifies a quagmire, covered indeed with grafs, but not folid enough to fupport the body; in which fenfe it differs from moors or fens only as a part from the whole. *See the articles* MOOR and FEN.

Mr. King, in his account of the bogs in Ireland, publifhed in the Philofophical Tranfactions, Numb. 170, imputes the true caufe of them to want of induftry.

" The fprings, fays he, with which Ireland abounds, are generally dry, or near dry in the fummer time, and grafs and weeds grow thick about the places where they burft out. In the winter, they fwell, run, and foften, and loofen all the earth about them. The fward or fcurf of the earth, which confifts of the roots of grafs, being lifted up and made fuzzy by the water in the winter, as I have feen it lifted up a foot or two at the head of fome fprings, is dried in the fpring, and does not fall together, but withers in a tuft, through which arifes new grafs; which is alfo lifted up the next winter. By this means the fpring is more and more ftopt, and the fcurf grows thicker and thicker, till at firft it make that which we call a quaking bog; and as it grows higher and drier, and the roots of the grafs, and other vegetables become more putrid, together with the mud and flime of the water, it acquires a blacknefs, and grows into that which we call a turf bog. I believe that when the vegetables rot, the faline particles are generally wafhed away with the water, as being apt to be diluted in it. The oily, or fulphureal, are thofe which chiefly remain, and fwim on the water; and this is that which gives turf its inflammability.

" I muft confefs, that there are quaking bogs caufed otherwife. When a ftream or fpring runs through a a flat, the paffage, if not tended, fills with weeds in fummer, trees fall acrofs it, and dam it up: then, in winter, the water ftagnates farther every year, till the whole flat is covered. Afterwards, a coarfer kind of grafs fhoots up, peculiar to thefe bogs. This grafs grows in turfs, its roots confolidate together, and its height increafes every year; infomuch, that I have feen it as tall as a man.

" This grafs rots in winter, and falls on the tufts, and with it the feed, which fprings up the next year, and fo ftill makes an addition. Sometimes the tops of flags and grafs are interwoven on the furface of the water, and this becomes by degrees thicker, till it lies like a cover on the water: then herbs take root in it, and by the matting of their roots it becomes very ftrong, fo as to bear a man. I have gone on bogs which would rife before and behind, and fink where I ftood, to a confiderable depth; under which was clear water.

As a farther proof that want of induftry is the principal caufe of bogs, Mr. King obferves, that the higheft mountains in Ireland being full of fprings, and uninhabited, are over-run with bogs, as well as the plains, becaufe no care is taken to clear the fprings.

" Ireland, continues he, abounds in mofs more than, I believe, any other kingdom. This mofs is of divers kinds, and that which grows in bogs is remarkable. The light fpongy turf is nothing but a congeries of the threads of this mofs, as I have frequently obferved, before it be fufficiently rotten. The turf then looks white, and is light. I have feen it in fuch quantities, and fo tough, that the turf-fpades could not cut it. In the north of Ireland, they call it old-wives tow, being not much unlike flax. The turf-holes, in time, grow up with it again; and all the little gutters in bogs are generally filled with it. To this I chiefly impute the red or turf bog; and from the fame caufe even the hardened turf, when broken, is ftringy; though there plainly appear in it parts of other vegetables: and I am almoft, from fome obfervations, tempted to believe, that the feed of this bog-mofs begets heath, when it falls on dry and parched ground. However, the mofs is fo fuzzy and quick growing a vegetable, that it greatly ftops the fprings, and contributes to thicken the fcurf, efpecially in red bogs, where I remember to have obferved this moft particularly."

A flat fpot of ground, lower than the level of an adjoining river or lake, may alfo give rife to a bog; for when that part is filled up by the flime and earth brought from the furrounding grounds, and the rotten plants and animals, which are buried in it, have choaked it up, it will become a bog; and then the water will continue to flow into it from the river or lake, efpecially when either of thefe is fwelled by a fall of rain, or the melting of fnow. Thefe waters may alfo fometimes have this effect, without a communication above ground, by foaking through a fandy or gravelly foil.

Another caufe of bogs have frequently arifen from the fall of a number of trees, which, being neglected, have neceffarily occafioned a ftagnation of the water brought down from higher grounds; fo that the earth and other foil conveyed with it, have of courfe remained among the fallen wood, and given birth to a moffy ground, which, it is plain from hence, is not an original foil. Coarfe grafs, and weeds which cattle will not eat, fpring up in thefe places, and die there, after fhedding their feeds, which, being prevented from rotting by the bituminous acid in the moffy water, produce new plants; fo that, this being repeated every year, an annual addition is made to the depth of the mofs.

Draining of BOGS. Among the many and great inconveniences which neceffarily arife from bogs, Mr. King mentions the following, as cogent reafons why every endeavour fhould be ufed to bring them, firft to a lefs hurtful ftate, and afterwards to a condition in which they may be of fervice to mankind.

" The fineft and fmootheft plains, which generally fhould be meadows, are often covered with ufelefs, too often with really pernicious bogs. Thefe bogs are a great deftruction to cattle, the chief commodity of Ireland. In the fpring time, when the cattle are weak and hungry, the edges of the bogs are commonly cloathed with grafs, and the beafts, in venturing to get it, fall into pits or floughs, where they are either drowned, or, if they are found, hurt, and often maimed, in the pulling out. The fogs and vapours which arife from thefe places are commonly putrid, ftinking, and very unwholfome: for the rain which falls on them, ftagnating upon their furface, and in their hollows, than which there is hardly any fubftance, equally foft, more impenetrable by water, corrupts there, and is exhaled by the fun; fo that, very little of it running off, it muft of neceffity affect the air. They corrupt other water, both in its colour and tafte: for the water which ftands in the pits, or lies on the furface of the bog, is tinctured by the reddifh-black colour of the turf; and when a ſhower comes, ſo as to make theſe pits overflow, the water which runs from them tinges all it meets, and gives its colour and ſtench even to many rivers. The only advantage derived from any bog, is turf for fuel. It makes a tolerable ſweet fire, in the common way of uſing it; and is, when charred, perhaps, the ſweeteſt and wholeſomeſt thing that can be burnt, fitter for a chamber, and for conſumptive people, than either wood or coal.

"All the inconveniencies of our bogs, continues Mr. King, may be remedied, and they may be made uſeful to us, by draining: for I never obſerved one bog without a fall ſufficient to drain it, nor do I believe there is any. The great objection againſt this improvement is the expence; in which I cannot but think the people are often terrified without ſufficient cauſe. One trench will drain many acres in quaking bogs, which, when dry, are generally meadow, or the beſt grazing ground. Every red bog has about it a deep, marſhy, ſloughy ground, which is called the bounds of the bog. A deep trench round ſuch a bog keeps out cattle, and turns the bounds into good meadow. I remember a red bog of ſixty acres, which a gentleman reduced to good grazing ground, worth three ſhillings an acre, for twenty-five pounds, which is leſs than three year's purchaſe. In all improvements of this kind, gentlemen ſhould conſider, that what they lay out goes by degrees, ſo that they ſcarcely feel it; that it goes among their tenants, whom it helps to enable to pay their rent; that they do a work of charity in employing the poor; and that they at the ſame time contribute to both the ornament and general profit of the kingdom.

"The deep trench before mentioned, round a red bog, not only drains and improves the bounds of the bog, as I ſaid before, but goes a great way towards drying the bog itſelf. It ſerves likewiſe as a common ſink, into which all the drains vent themſelves. Theſe drains ſhould be cut ſo as to croſs the little ſloughs that run in the bog. The firſt drains ſhould not be above two or three feet deep, or wide: for the bog is ſo ſoft, that deep trenches will not ſtand, but fill up again. When the ſurface of the bog is cut in little trenches, ſuppoſe at twenty, thirty, or forty perches diſtance, it will ſoon be ſo dried that cattle may graze on it all the ſummer. A year or two after this, by which time the bog will be ſomewhat dry towards the ſurface, the drains may be made ſix feet wide, and as deep as the ſoftneſs of the bog will permit. This will certainly make the bog uſeful for grazing: and at the end of another year or two, an attempt may be made to cut one or two of the trenches down to the bottom of the bog; for till that be done, I do not reckon the bog ſecured. A gentleman may oblige all his tenants to cut their turf in theſe trenches, and likewiſe have his own cut there." *Philoſophical Tranſactions, Numb.* 170.

Small bogs may be turned to very good account by planting them with oſiers, willows, and alders: but where the extent is conſiderable, this object becomes of too little conſequence. Draining will be however neceſſary before they can be improved any other way; as a previous ſtep towards which, it will be neceſſary to examine from whence their too great quantity of water ariſes, and what retains it. When the cauſes are known, their effects will be the more eaſily removed.

The ſources from whence the too great quantity of water proceeds, may either be without or within the bog. This is eaſily diſcovered by the greater quantity of water in one place than in another, and obſerving that the water ſpreads from thence, even under the ſurface, as through a ſponge.

If the water from without comes from neighbouring grounds, it is uſually kept off by a ſurrounding ditch, made large enough to contain the quantity that may at any time flow down, and by extending that ditch to the moſt convenient outlet, according to the declivity of the ground. If the bed of gravel or ſand through which the ſprings within the bay run, be cut quite through, the ſource of thoſe ſprings will certainly be deſtroyed; and if that bed be only opened in digging this ſurrounding ditch, the water will ſo readily diſcharge itſelf thereby, that the ſprings will probably be dried up.

Before any drain be made in the bog itſelf, an exact level of the ground ſhould be taken; and when the two great moiſture proceeds from a ſpring or ſprings within the bog, a large ditch ſhould be made, beginning at the loweſt part of the bog, where an outlet can be had, and continued from thence to the ſpring. If the bog be firm enough to bear it, this ditch ſhould be dug down to the very bottom of the bed on which the peat or moſs is formed, which, in caſe of ſprings, is always gravel or ſand: for otherwiſe the water would force itſelf a paſſage in another part, and ſo make it neceſſary to extend the ditch thither. If there be more ſprings than one, the main ditch muſt be extended to each of them. In all caſes, the ſureſt way is to dig the ditch, where it can be done, at leaſt a foot deeper than the ſpring lies. Between the principal ditches cut in the bog, there ſhould be ſmaller, emptying themſelves into thoſe larger, to carry off the remnant of ſtagnating water, and to preſerve the ſurface dry. Care ſhould be taken not to lay the earth dug out of any of theſe ditches too near their ſides, leſt its weight ſhould make them fall in.

Bogs are generally higher than the land about them, and higheſt in the middle; the chief ſprings that cauſe them being generally about the middle, from whence they extend by degrees, and puff up the earth in ſuch a manner, that perſons are often apt to think the ſprings lie deeper than they really do. A ſure way to know whether the ditch be deeper than the ſpring, is, to obſerve whether the water comes in at its bottom, or through the ſides. The width of the main ditch ſhould be proportioned to its depth; and both will, in a great meaſure, depend upon the quantity of water neceſſary to be drained. In general, it ſhould widen progreſſively from its head to its outlet, becauſe the quantity of water in it will be conſtantly encreaſed. The ſides of the ditch ſhould always be dug either more or leſs ſloping, according to the ſoil. If the ground be very looſe and light, and conſequently very liable to fall in, it will ſometimes be neceſſary to make a ſlope ſo great, that the top of the ditch will be four times as wide as its bottom. If the ſoil be ſtiffer, the ſlope may be leſs; but no ditch ſhould ever be dug quite perpendicular.

If a deep trench be cut through a bog, the original ſpring will be found, vaſt quantities of water will iſſue from it, and the bog will ſubſide. Mr. King ſays that he was informed that the bog at Caſtle Forbes, where this was done, ſubſided thirty feet, a fall which ſeemed indeed incredible: but he found by computation that it could not be leſs than fifteen.

Mr. Elliot's contrivance for draining a bog, or what he calls a ſhaking meadow, containing about forty acres, deſerves to be mentioned, for the ſingularity as well as the uſefulneſs of the invention. The ſurface of this ground, over-run with cran-berry vines and wild graſs, ſeemed to be only a ſward of their roots laid over a pappy mud, and was deemed ſo poor that nobody would rent it. At the ordinary outlet of this meadow, there was a ſufficient fall, but very rocky, ſo that it was neceſſary to dig four or five feet to take advantage of it. In March, when this gentleman went to make the outlet drain, the torrent of water was ſo great, that nothing could be done in the uſual way. He therefore ordered a tree to be felled a croſs the brook, and pieces of plank, the upper ends of which reſted againſt the tree, to be driven down aſlant into the mud. The chinks and crevices of theſe planks were then cloſely ſtopped with tow, by which means the water was ſhut into the meadow. The trench or main ditch was then worked at in the day, and the water let out at night, till the drain was completed. When the weather grew ſufficiently warm, and the meadow was a little ſettled, croſs ditches were cut, one on each ſide, and another in the middle, and, ſo far as they extended, the meadow ſoon became firm and dry. "Some, adds Mr. Elliot, are deterred from ſuch an undertaking as that of draining their land, by reaſon of the great charge. They terrify themſelves without reaſon. When I was about to cut my main drain, ſome thought it impoſſible; others, that it would coſt, at leaſt, an hundred pounds. The place was full of rocks, ſome of which we dug up, others were broken with ſteel wedges, and others were blown up with powder. The whole expence

pence did not exceed twenty pounds." *Essay I. on Field Husbandry*, p. 7.

When the ditches and trenches are finished, great care must be taken to keep them in good and lasting condition, lest all the labour bestowed upon them should be lost. There are different ways of doing this. If the ditches are left open, they must be well cleansed from weeds and mud, twice every year, once in the spring, and once in the autumn. It will also be right to drive in from space to space, along the inside of their banks, strong stakes of oak or alder, to strengthen them, and keep them from falling in. Willows, which delight in a watery soil, may be advantageously planted upon these banks, which their roots will help to keep up and bind.

If a bog be so entirely surrounded with high grounds, as not to have any declivity whatever, by the help of which its waters may be drained off, ditches must then be dug round it, to receive the water from the neighbouring hills, and a very large pond must be made in the middle or lowest part of the bog itself, for its waters to run into; to facilitate which, large trenches should be cut from the surrounding ditches to this pond, and channels communicating with these trenches a-cross different parts of the bog. The number and size of which will depend on the greater or less wetness of the ground. When the water is thus collected, engines must be used to raise it to a proper height for a channel to carry it off. The reader will find a description of several new and useful engines of this kind under the article, DRAINING MACHINES.

Improvement of drained BOGS. The most lasting and most perfect improvement of bogs, is effected by paring off their surface and burning it. *See the articles* MOOR and BURN-BAKING. In order to this the bogs should be levelled; and whatever earth remains unemployed in filling up hollows, should be burnt together with that taken out of the ditches, unless the latter has been already carried off for fuel. The greater quantity of ashes there is, the greater will be the improvement of the soil itself, and the more will the earth brought upon it be benefited. The fire on the surface of the moss, exhales a very considerable part of the bituminous acid of this soil, and the fixed alkaline salt, always found in some proportion in the ashes, corrects or neutralizes it, so that no inconvenience arises from it afterwards, if the ground be kept dry as it ought to be. The fire should not be fierce but rather smothered.

When the bog is pared, and the clods are collected to dry, the farmer must prepare earth to cover the surface. Marle, which is often found under bogs, presents the best covering that can be desired. If a clay lies under the bog, it must be prepared before it is spread in the manner directed under the article COMPOST, excepting only that the quantity of other substances mixed with it, such as dung, &c. need not be so great in this case, because the ashes, and the bog itself, will greatly assist in opening the body of the clay. If a loamy earth be near at hand, it will perhaps be less expensive to the farmer to bring such earth to cover the bog, than it will be to dig and prepare the clay. But of whatever kind the earth be, which is laid upon the bog, the quantity should always be sufficient to cover its whole surface four, five, or six inches deep, according to the stiffness of the soil so brought. Thus four inches of clay, when mixed with the ashes, and a due quantity of the earth of the bog itself, will give a depth of covering mould equal to what six inches of loam will do, when likewise mixed in proportion to its quality. If the bog be intended for arable land, the depth of the covering earth should be greater; because all kinds of grain, especially wheat, require at least a foot depth of good mould to extend their roots in, before they come to any cold or tenacious substance like peat or clay. The covering, therefore, of clay or marle should be in this case, six or seven inches thick, and that of loam eight or nine inches.

As soon as the surface is burnt, its ashes should be spread and mixed with the additional covering, which will then be fit for the farmer's purpose, whether for corn or grass. If the extent of the bog intended to be improved be considerable, it should be advisable, by means of a sluice, to fill the ditches contiguous to the spot which is to be covered, and to bring the earth in barges, or flat-bottomed boats, kept on purpose to transport the necessary manures, and the produce of the ground. By this means a saving will be made of the surface otherwise necessary for cart-ways. Besides, this soil, especially, when newly trained, does not well bear heavy carriages: a circumstance which renders it needless to observe, that broad wheels are always the most proper, when any must be used upon such land.

The bog being covered with a proportion of earth, the husbandman must next determine to what lasting purpose he can best apply it. The too great moisture of these soils, which always lie flat, renders them unfit for continued tillage; and their mould becomes so loose, by frequent ploughing, that it does not afford sufficient stability to the roots of corn. For this reason, barley, oats, and rye, do better here than wheat, which requires a firmer footing: but neither of them should ever be sowed thick; because the fruitfulness of the soil will always make up in the size of the plants, what some might think wanting in their number. The most beneficial method of employing this sort of land is, undoubtedly, by converting it into meadow; because, when thus prepared, and not injudiciously exhausted by crops of corn, it will yield great quantities of excellent grass. It is, however, usual to begin with sowing some kind of grain on this prepared surface, to indemnify the farmer by the plentiful crop which it generally yields; such, indeed, as sometimes defrays at once the whole expence of the improvement. Perhaps the most profitable method may be, to sow it in the autumn with rape, the leaves of which, shading the surface in hot weather, and rotting in the winter, contribute greatly to mellow the earth: the strong roots of this plant open the soil; its ashes enrich it, when burnt, and its seed brings a great return when sold for making oil. One or two ploughings will then prepare it for a crop of wheat. After this is taken off, and the stubble turned down or burnt, white clover and grass seed from upland pastures should be sowed, and the ground should then be laid down for a lasting meadow; or, if turnips are sowed, or cabbages planted, in the autumn, these, in the spring, may be succeeded by barley, with which the grass seeds may be sowed.

When, either through necessity, for want of other arable land, or out of choice, the farmer intends to continue ploughing his improved bog, the surface must be raised in ridges, and the farther management of it may be like that of most other ploughed grounds.

If a soil of this kind happens to be situated near a town, a greater profit will accrue from planting it with garden stuff, than from any sort of grain. Beans, pease, cabbages, potatoes, turnips, carrots, &c. thrive exceeding well in such earth as this, as the marquis of Turbilly experienced to his entire satisfaction.

" I received, says he, from Strasburg, in the year 1755, some seed of the large hard cabbage, which was immediately sowed in my garden, from whence it was afterwards transplanted into a bog, which I had drained and cleared. This spot contains about an acre of ground, and forms a kind of island in my river. It had been pared and burnt; but never received any other manure than the ashes produced by that burning; no sort of dung having ever been laid upon it. The whole of it was planted with this kind of cabbage, excepting only a corner, where a few carrots, parsnips, and beet-roots, all of which grew to a prodigious size, and proved exceeding good, were set out of curiosity. These cabbages throve wonderfully, several of them weighing forty pounds a piece, were well tasted, and very wholesome, though some of the country people seemed positive that they and the other pot-herbs would be hurtful, unhealthy food, as, said they, all plants are during the first year of their growth in new drained bogs.

" These people pretended to have experienced this in other places; but not finding it so here, I ascribed the effect they talked of to some pernicious quality in the soil; for I was very sure, that the violent operation of the fire which mine had undergone, had not left any bad property in the earth. During the rest of the summer, and the autumn, some of the neighbouring peasants, whom I hired for the purpose, carried this great quantity

tity of cabbages to the markets of three different towns, about ſix miles off: there they ſold them; and the accounts which they gave me of their produce amounted in all to eight hundred and fifty livres, that is thirty-ſeven pounds, three ſhillings, and nine pence. The wages of theſe men and the expence of carriage, amounted to about half this ſum; which being deducted, my acre of bog produced clear four hundred and twenty-five livres, that is, eighteen pounds eleven ſhillings, and ten-pence halfpenny, with which I was the better ſatisfied, as the cultivating of it had coſt me but little. The ſoil, being light, was eaſily turned up, though fat; and I had drained off the water without difficulty, by means of a ſlope which happened to be properly ſituated. I never had been offered above a crown a year for this marſhy land, which was quite a ſhaking bog, and often overflowed. When drained, its ſurface ſunk a foot lower than before. So great a produce, from ſo ſmall a ſpot of ground, of which no one knew the goodneſs, ſhews what vaſt riches are hid beneath the ſeveral bogs in this kingdom. They are not, however, all like this, which chanced to be a very fertile ſoil. I could wiſh to be maſter of ſeveral others like it. It has ſince been ſowed with hemp, peaſe, and ſeveral other plants, which have done very well, though none of its crops have produced ſo much money as this firſt; which ſhews the difficulty of ſetting a juſt value upon land. All the other bogs which I have drained and cleared in different ways, have anſwered, in general; but no one ever yielded, in proportion, any thing like this ſpot." *Memoire ſur les Defrichemens, pag.* 167.

BOG-*Spavin*, an encyſted tumour, or according to doctor Bracken, a collection of browniſh gelatinous matter, contained in a bag or cyſt, which he thinks to be the lubricating matter of the joint altered, the common membrane that incloſes it forming the cyſt: this caſe he has taken the pains to illuſtrate by an inſtance of a young colt of his own, where he obſerves, that when the ſpavin was preſſed hard on the inſide of the hough, there was a ſmall tumour on the outſide, which convinced him the tumour was within ſide the joint: he therefore cut into it, diſcharged a large quantity of this gelatinous matter, dreſſed the ſore with doſſils dipped in oil of turpentine, putting into it, once in three or four days, a powder compoſed of calcined vitriol, alum, and bole: by this method of dreſſing, the bag ſloughed off, and came away, and the cure was ſucceſsfully completed without any viſible ſcar.

This diſorder, according to the above account, will ſcarcely ſubmit to any other method, except firing, when the cyſt ſhould be penetrated to make it effectual; and in all obſtinate caſes that have reſiſted the above method, both the cure of this, and the ſwellings called wind-galls, ſhould be attempted in this manner. If, from the pain attending the operation or dreſſings, the joint ſhould ſwell and inflame, foment it twice a day, and apply a poultice over the dreſſings, till it is reduced. *Bartlet's Farriery, pag.* 279.

BOIL, a diſeaſe to which cattle, eſpecially ſheep, are very ſubject.

In order to cure theſe boils, it will be neceſſary to bring them to a head, by applying to them a plaſter compoſed of wheat flour, yolks of eggs, and tar: and when they feel ſoft under the finger, to open them with a lancet, and let out the matter. Then anoint the part with ointment of tobacco, and apply over it the following plaſter. Take of turpentine, burnt ſalt, honey, and galbanum, of each one ounce; of roſin an ounce and a quarter. Melt the whole into a ſalve over the fire. *Ellis on Sheep, pag.* 101.

BOLE, the body or trunk of a tree.

Bole alſo ſignifies the ſtalk or ſtem of corn.

Bole, a meaſure of corn, containing four buſhels.

Bole *of ſalt*, contains two buſhels.

BOLING *Trees*, pollard trees, or thoſe whoſe heads and branches are cut off, and only the boles or bodies left.

BONE, a hard, brittle, inſenſible part of an animal body, affording form and ſupport to the whole machine.

All marrow-bones, fiſh-bones, hoofs, horns, or ſhavings of horn, are very uſeful in manuring lands. Bones are moſt ſerviceable when raſped or broken into ſmall pieces; becauſe their ſalts, in which their principal virtue conſiſts, are more eaſily extracted by the rains and dews, and communicated to the ſoil.

Bone-*Spavin*, a boney excreſcence, or hard ſwelling growing on the inſide of the hock of a horſe's leg.

A ſpavin that begins on the lower part of the hock, is not ſo dangerous as that which puts out higher, between the two round proceſſes of the leg-bone; and a ſpavin near the edge is not ſo bad as that which is more inward towards the middle, as it does not ſo much affect the bending of the hock. A ſpavin that comes by a kick or blow, is at firſt no ſpavin, but a bruiſe on the bone, or membrane that covers it; therefore not of that conſequence, as when it proceeds from a natural cauſe: and thoſe that put out on colts, and young horſes, are not ſo bad as thoſe which happen to horſes in their full ſtrength and maturity; but in very old horſes they are generally incurable.

The uſual method of treating this diſorder, is by bliſtering and firing, without any regard to the ſituation or cauſe, from whence it proceeds. Thus if a fullneſs on the fore-part of the hock comes after hard riding, or any other violence which threatens a ſpavin, ſuch coolers and repellers are proper as are recommended in ſtrains and bruiſes. Thoſe happening to colts and young horſes are generally ſuperficial, and require only the milder applications; for it is better to wear them down by degrees, than to remove them at once by ſevere means.

There are various forms for making what is called the bliſtering ointment; but of the beſt of that kind, and what will infallibly anſwer the intention, has been already given under the article Blistering Ointment.

When a bliſter is thought neceſſary, the hair ſhould be cut as cloſe as poſſible, and then the ointment applied pretty thick over the part; this ſhould be done in the morning, and the horſe kept tied up all day without any litter till night; when he may be untied in order to lie down; and a plaſter of pitch, or any other ſticking ſubſtance, may be laid over it, and bound on with broad tape, or a bandage, to keep all cloſe.

After the bliſter has done running, and the ſcabs begin to dry and peel off, it may be applied a ſecond time in the ſame manner as before; the ſecond application generally taking greater effect than the firſt, and in colts and young horſes makes a perfect cure.

When the ſpavin has been of long ſtanding, it will require to be renewed perhaps five or ſix times; but after the ſecond application a greater diſtance of time muſt be allowed, otherwiſe it might leave a ſcar, or cauſe a baldneſs; to prevent which, once a fortnight, or three weeks, is often enough; and it may in this manner be repeated ſix or ſeven times, without the leaſt blemiſh, and will generally be attended with ſucceſs.

But the ſpavins that put out upon older, or full aged horſes, are apt to be more obſtinate, as being ſeated more inward; and when they run among the ſinoſities of the joint, they are for the moſt part incurable, as they then lie out of the reach of applications, and are arrived to a degree of impenetrable hardneſs.

The uſual method in theſe caſes is to fire directly, or to uſe the ſtrongeſt kind of cauſtic bliſters; and ſometimes to fire and lay the bliſters immediately over the part; but this way ſeldom ſucceeds farther than putting a ſtop to the growth of the ſpavin, and is apt to leave both a blemiſh and ſtiffneſs behind; beſides the great riſk run (by applications of theſe fiery and cauſtic medicines, to the nervous and tendinous parts about the joints) of exciting violent pain and anguiſh, and deſtroying the limb.

The beſt and ſafeſt way therefore is to make trial of the bliſtering ointment given under that article, and to continue it according to the directions above laid down, for ſome months, if found neceſſary; the horſe in the intervals working moderately: the hardneſs will thus be diſſolved by degrees, and wear away inſenſibly.

When the ſpavin lies deep, and runs ſo far in the hollow of the joint, that no application can reach it, neither firing nor medicines can avail, for the reaſons abovementioned: though bold ignorant pretenders have ſometimes ſucceeded in caſes of this ſort by the application of cauſtic ointments

ointments with ſublimate, which act very forcibly, enter deep, and make a large diſcharge; deſtroying by that means a great part of the ſubſtance, and diſſolve away the remainder. Though whoever is at all acquainted with the nature of ſuch medicines, muſt know how dangerous in general their operation is on theſe occaſions, and that a properly prepared cautery made like a fleam, under the direction of a ſkilful hand, may be applied with leſs danger of injuring either tendons or ligaments. After the ſubſtance of the ſwelling has been properly penetrated by the inſtrument, it muſt be kept running, by precipitate mixed with the medicine uſed in dreſſing the part, or with a mild bliſtering ointment.

Where the ſpavin lies not deep in the joint, and the bliſtering method will not ſucceed, the ſwelling may be ſafely fired with a thin iron forced pretty deep into the ſubſtance, and then the part ſhould be dreſſed as above directed. *Bartlet's Farriery, pag.* 257.

BOORCOLE. *See* BORECOLE.

BOOSE, a ſtall. Thus ox-booſe ſignifies an ox-ſtall, &c.

BOOT, profit, gain, advantage.

BORAGE, an annual plant, propagated in gardens, and if ſuffered to ſcatter its ſeeds, the plants will come up in plenty without care; or if the ſeeds are ſown either in ſpring or autumn, on a ſpot of open ground where the plants are deſigned to remain, the ground be hoed to deſtroy the weeds, and the plants cut up where they are too near each other, they will require no further care; unleſs the weeds ſhould come up again, when the ground ſhould be a ſecond time hoed over again to deſtroy them. This, if well performed in dry weather, will clear the ground from weeds, ſo that it will require no more cleaning till the borage is decayed. *Miller's Gard. Dict.*

BORECOLE, or BOORCOLE, a ſpecies of cabbage, of which there are three ſorts, namely, the common borecole, the green borecole, and the Siberian borecole, which is the curled colewort, by ſome called Scotch kale. All theſe are for winter uſe, but the laſt is moſt eſteemed. The two former are ſown about the middle of April, and are fit for tranſplanting in about two months after. When this is done, the plants of either of theſe ſorts ſhould be ſet a foot aſunder in rows two feet diſtant from each other. They ſhould not be eaten before the froſt has rendered them tender; for till then they are tough and bitter. The Siberian borecole, which is extremely hardy, never injured by froſt, and always ſweeter in ſevere winters than in mild ones, need not be ſown till the middle of July, and when the plants are ſtrong enough for removing, that is when they have ſix or eight leaves, they ſhould alſo be ſet in rows; the diſtance between which ſhould be about two feet, and that between the plants, ten inches. Theſe will be fit for uſe ſoon after Chriſtmas, and continue good till April. The ſoil for borecole ſhould be a good, freſh, deep-looſened earth.

Borecole has been lately found by Mr John-Wynn Baker, to be an excellent food for cattle; and the Society for the Encouragement of Arts has accordingly offered two premiums for cultivating it, one of twenty, and the other of fifteen pounds.

Mr. Baker made the experiment under the direction of the Dublin Society, who deſired him to print his account of the experiment, an abſtract of which we ſhall give the reader.

This experiment was made on a piece of ground that had been cropped the preceding year with potatoes. After he had reduced the ſoil to a pretty good tilth, and manured it with a compoſt compoſed of earth, lime, and dung, he planted three rows of borecole plants, in ridges two feet aſunder. On the 17th of Auguſt they were horſe-hoed for the firſt time, by taking off, at one furrow of the plough, only one ſide of each ridge cloſe to the plants; in which manner they remained till the twenty-fifth, when he ran the plough in the ſame furrow, by which, with the firſt furrow, he ploughed about twenty-one inches deep. This being finiſhed, the earth was immediately returned back to the plants, which afforded them freſh nouriſhment; and in order to give their roots time to penetrate this freſh earth, which, by the horſe-hoeing was become very fine mould, he let them remain in this ſtate till the 12th of September, when he horſe-hoed them again, by taking off the other ſide of every ridge; and on the twentieth deepened the furrow in the ſame manner as the former, and immediately returned the mould back to the plants; and on the eighteenth threw up a ſmall furrow to each ſide of every ridge, which finiſhed the culture, and reſtored the ridges to the form they were in when the borecole was planted.

"On the 18th of December, continues Mr. Baker, I cut two perches in length of one of the rows of borecole, which contained twenty-one plants; they weighed one hundred and eighteen pounds, which is very near five pounds ten ounces for each plant: but I am inclined to believe that theſe plants will ſucceed as well, if they are planted only eighteen inches aſunder in the rows. However, at the above proportion, there would be ſeventeen tons, and fourteen hundred upon an acre. But, if the produce would be the ſame, were the plants only eighteen inches aſunder, in that caſe, an acre would produce, by this culture, above twenty-three tons, and twelve hundred.

"This plant is well worthy the farmers or grazier's attention, for, as faſt as it is cut, it will again, in about a month or ſix weeks, afford another crop: I have been cutting theſe plants for my family uſe, ever ſince the middle of Auguſt laſt; I believe ſome of them have been cut three times, and they are excellent for the table. For feeding cattle and ſheep they are highly valuable, as no froſt will injure them; and although the firſt crop amounts not to as many pounds upon any given quantity of ground as thoſe of cabbage or the turnip-cabbage, yet the ſucceeding crops will, I believe, make their produce nearly, or quite, of equal weight with any other of the cabbage kind. But I muſt not omit to obſerve, that, as theſe plants afford only open leaves, and many of them very ſmall, there will be a little more trouble in collecting and carrying them to the ſheep and cattle, than there will be with the other kinds.

"It may not be improper to obſerve likewiſe, that, upon the approach of ſpring, when they begin to throw out their ſpring ſhoots for ſeeds, if the large leaves have not been taken off for winter uſe, they will decay and fall off.

"I have not yet tried it; but I believe the beſt way of uſing this plant, would be to allot one whole field to the culture of it, proportioned in ſize to the ſtock intended to conſume the produce; and in September or October, to turn the ewes into the field for a few hours, morning and evening, and then to lodge them on any piece of graſs or fallow, which may want improvement, to which they will greatly contribute by emptying themſelves upon it; and thus continue to turn them into the borecole field, till they have eat all the luxuriant leaves; then let the plants reſt a month, and there will be another crop. By having two ſmall fields under this crop, a flock of ſtore ſheep might be maintained a whole winter at a very ſmall expence; for while the produce of one field would be conſuming, the other would be coming on.

"This method accrued to me from an accident which attended my borecole this year. My cows got into the field, and preſently devoured ſome of the leaves of the plants; theſe plants have engaged my attention ever ſince, and I have the pleaſure of ſeeing them again in a very luxuriant ſtate.

"If any perſons ſhould be able to put this ſcheme in practice, before I can accompliſh it, I recommend it to them not to let the ſheep paſture ſo long on the crop, as to injure the ſtalks for want of leaves; as too great an injury to the ſtalks may check the ſucceeding growth; which injury, I am inclined to believe, will not happen to the plants, at leaſt not in ſo great a degree, whilſt they have a ſufficient quantity of leaves.

"It will doubtleſs be obſerved, that I confine this ſcheme to ewes or ſtore ſheep: my reaſon for that is, that fat ſheep ſhould always have as much food before them, as they chooſe to eat; add to this that ſheep when they are fat, are more ſubject to be lame than ſtore ſheep, to which ploughed ground will greatly contribute."

BORDER, a bank raifed about a garden, and planted with flowers, fruit-trees, &c.

Borders are of four forts: thofe are the moft common, that are continued about parterres without any interruption; and wrought with a gentle rifing in the middle, like an afs's back, and planted with low fhrubs and flowers.

The fecond fort of borders are fuch as are cut into compartments, at convenient diftances, by fmall paffages, and being alfo raifed in the middle, as before-mentioned, are likewife fet off with fhrubs.

The third fort are fuch as are laid even and flat, without flowers, having only a verge of grafs in the middle; being edged with two fmall paths, raked fmooth, and fanded. Thefe are fometimes garnifhed with flowering fhrubs, and flowers of large growth; or with vafes and flower-pots placed regularly along the middle of the verge of grafs.

The fourth fort are quite plain, and are only fanded, as in the parterres of an orangery; and are filled with cafes ranged in a regular order along thofe borders, which are edged with box on the fides next to the walks; and on the other, with verges and grafs-work next the parterre. Sometimes a yew is planted between each cafe, which makes the border appear richer, and the parterres handfomer, during the winter feafon.

Borders are either made ftraight, circular, or in cants, and are turned into knots, fcrolls, voluces, and other compartments.

Florifts alfo make borders either long walks, or detached; and in thefe they raife their fineft and choiceft flowers. Thefe are frequently encompaffed with border boards painted green, which makes them look exceeding neat.

But, in large parterres, this is not to be expected; fince, if they be ftocked with flowers fucceeding one another in their feveral feafons, it is fufficient, fo that nothing appears bare and naked.

It is ufual to difcontinue the borders at the ends next to the houfe, that the embroidery and rife of the parterre may not be hidden by the fhrubs and flowering plants, and that the defign may be better judged of.

And fometimes there are branched out of it foliage, palm-leaves, and fhells fporting among the fands.

Since the modern tafte of gardening has been introduced into England, all the French tafte of parterres, fcroll borders, and fret work in box, has been juftly banifhed our gardens: therefore I have only mentioned them here, to expofe the tafte of thofe architect-gardeners, who have no idea of the noble fimplicity of an open lawn of grafs, properly bounded by plantations; but, inftead of this, divide that part of the garden, near the houfe, into various forms of borders edged with box, and fand or gravel-walks leading about them; by which the ground is cut into many angles, fcrolls, &c. which is very hurtful to the eye of a judicious perfon: therefore, where flowers are defired, there may be borders continued round the extent of the lawn, immediately before the plantations of fhrubs; which, if properly planted with hardy flowers to fucceed each other, will afford a much more pleafing profpect than the ftiff borders made in fcrolls and compartments, after the French manner, can poffibly do.

Thefe borders may be made fix or eight feet wide, in proportion to the extent of the garden, and fize of the lawn: for a fmall lawn fhould not have very broad borders; nor ought a large lawn to be bounded by fmall borders; fo that a due proportion fhould be always obferved in the laying out of gardens. *Miller's Gard. Dict.*

Mr. Hitt, in his Treatife of Fruit-trees, has laid down the following directions for making borders for peaches, nectrines, pears, plums, cherries, &c.

" If the land, fays he, be a ftrong clay, take fea-fand, if it may eafily be had, if not, any other fand that is neareft, and about one fixth of the quantity of coal-afhes, that have been kept very dry; riddle them, but not too fine; for if fome of the larger parts be left, they will difunite the tough body of clay, and make it more open and tender, and the finer parts that are more burnt, will add more falts to it.

" But if afhes cannot be had, take about a twelfth part as much lime as fand. About a third part of the depth of the borders ought to be of thefe ingredients; and in trenching the borders, there muft be a layer of thefe, and a layer of the natural foil, from the bottom to their furface, in the above proportion; but they ought to be turned over twice at leaft before plantings, in order to mix them the better.

" If the foil of borders is mixed with large pebbles, they muft be picked out, and may be of ufe, though otherwife hurtful, to lay in the drains.

" And as this kind of land is generally of a loofe fandy nature, it muft be mixed with fomething more ftrong and binding, which is clay, the tougheft that can be got, and neareft. If it be taken from the fides of ditches, whofe foil is naturally a clay, or from ditches in which there is fometimes a current of water falling from tillage fields of that kind of foil, and there leaves its fettlement, it will be as good as any.

At the bottom of the borders lay this clay fix inches thick throughout, it will prevent the moifture from running off too faft in the fummer, as it is apt to do from open fandy ground, efpecially where there are any drains made; then to each cart load of clay add three pecks of pigeon dung, or lime, or five of foot, and mix them with a quantity of the natural foil equal to half of them: if coal or wood afhes are made ufe of inftead of foot, they muft be made very fine, otherwife they will open this fort of land too much; befides, the finer they are made, the more falts they add to it.

" But where fandy lands are dry, the draining part muft be omitted; and the other ingredients only are to be made ufe of. It may be faid, that trees will grow well upon fandy land, without any improvement: I grant they will: but they are not fo long-lived, being more fubject to blights, and the fruit is both fmaller, and of a worfe tafte, than thofe upon ftronger ground inclining to clay.

" If land defigned for a garden is either hard rock or creach, and lies within the depth which the borders ought to be, let it be picked up and fkreened to take out the ftones; which will be of fervice when laid under grafs or gravel walks; as they will be drier, and lefs fubject to worm fprouts. Then as you find the land, after fkreening, either light or ftrong, add to it one of the mixtures which you fee it wants, according to the former directions, to bring it to a proper depth, and a foil more inclining to clay than fand, with a covering of ftrong clay at the bottom fix inches thick.

" If the land be frefh and proper for fruit-trees, yet it ought to be trenched as deep as others; and if towards the top there be ufed a fmall quantity of the ingredients mentioned before for the enrichment of foils, it will be of good fervice; for it muft be noted, that in making the trenches, the worft part of the foil will be uppermoft.

" If borders are to be planted with trees where others have grown before, the depth and quality of the foil muft be examined, and if it be deep enough, and of a proper mixture of fand and clay, then it only requires trenching, with the former addition of lime or foot, &c. which will be a better border than if the cold earth had been taken out, and frefh laid in without lime, &c. and alfo much cheaper.

" In borders thus prepared to fix feet wide or more, though it is proper to make the borders as wide as the walls are high, I have known all kinds of fruit-trees profper well, and bear excellent fruit, except vines and figs; for which the natural foil may be mixed with rubbifh, as lime fcraps, fmall pieces of bricks, &c. for a foot deep in the bottom or more." *Hitt's Treatife on Fruit-trees, pag.* 6.

BORD-*Lands*, the demefnes which lords keep in their own hands, for the maintenance of their board or table.

BORD-*Service*, the tenure of bord-lands, by which the tenants were to provide provifions for their lord's tables. There is ftill fome remains of this tenure remaining; but the tenants pay only a fmall rent per acre, inftead of finding the provifions formerly required.

BORER, or *Screw-borer*, an inftrument invented by the marquis of Turbilly, for fearching or exploring the nature of any foil.

Thefe

This borer is compofed of two rods of iron, Plate I. Fig. 6 and 7. each fix feet long, and an inch in diameter. The end A, of Fig. 6, fcrews into the end B, of Fig. 7, after taking out the ftopper C, the ufe of which is to hinder either dirt or duft from getting into the fcrew. The fcrew is an inch and a half long, and three quarters of an inch in diameter. D, Fig. 6, is a fteel point fomewhat blunt to pierce the earth, or any fubftance it may meet with. It fhould be about three inches long, and made with either three, four, or more fides, as may be thought moft convenient. It is fcrewed into the rod A in the fame manner, and with a fcrew of the fame fize as A is fcrewed into the rod B. E is a groove fix inches long, a third of an inch wide, and three quarters of an inch deep, rounded in the bottom, and intended to bring up part of each different layer through which it paffes. When fprings are fought for, a bit of fponge is put into the groove. At the end F, of the rod, Fig. 7, is a fcrew to fix into another rod of the fame kind, if it be found neceffary to lengthen the inftrument; and this may be repeated by the addition of more rods, to any depth defired. G H, Fig. 6, is the handle of this inftrument, two feet and a half long. This handle is faftened to the rod by means of a clafp I, lined with fteel, fixed at one end by a hinge, and at the other by the fcrew L; fo that it may be placed at any height. Fig. 8, is the handle feparated from the rod, and marked with the fame letters as before. Fig. 9, marked with the fame letters as before, is another handle, or rather lever, like the handle already defcribed, except its having only one branch or lever marked G. This ferves to ftop the borer when we are bringing it up from a confiderable depth, and alfo to fcrew and unfcrew the feveral bars, or joints, as occafion requires: and to put on, or take off the fteel point at the bottom. The handle G A, Fig. 6, is that by which the rod is held, and worked into the earth, either by twifting it round, efpecially at firft, or after it has penetrated to the fame depth, by lifting it up, and letting it fall again, which it does with fuch force as to pierce even the hardeft rock; efpecially if it works at any confiderable depth, and has of courfe been lengthened accordingly; for every foot of this rod weighs three pounds. Two men will eafily found the depth of twelve feet in lefs than a quarter of an hour, if they do not meet with many ftones. When the rod becomes too heavy to be properly managed by hand, it may be raifed by a rope faftened at one end to the handle, and at the other to a roller, or kind of windlafs, erected at a proper height, perpendicularly over the hole, and turned with either one or both handles. This will coft but a trifle, and will eafily raife the other rod, which, when let go, will fall with fuch weight, as to ftrike each time very deep into the earth. The marquis tells us, that he has feen it worked in this manner to the depth of more than an hundred feet.

The tougheft iron is the beft for making this inftrument, which fhould be well hammered, till its furface be quite fmooth and even; for the leaft roughnefs and inequality would occafion a friction, which would greatly retard its working. For the fame reafon, and alfo to increafe the force of its fall, it is neceffary that it fhould be perfectly ftrait: nor fhould it ever be ftruck with a mallet, hammer, &c. to force it down; becaufe a blow might bend it, and it would eafily break afterwards. The female fcrew muft be turned like that in the breech of a gun barrel, in a feparate piece of iron, crofs-ways to the grain, and this piece muft be afterwards well foldered on to one of the ends of the rod. The reafon for this is, that if the female fcrew were bored only at the end of the rod, it would, by being hammered out in the fame direction with the grain, be ftringy and porous, and confequently fo weak as to give way, or burft, in the working of the rod; whereas when made of a feparate piece, taken crofs-ways of the grain, the threads of the fcrew will run with the grain of the iron, and be thence confiderably ftrengthened. A bit, like that of an augre, proportioned to the thicknefs of the rod, may at any time be fubftituted inftead of the fteel point, to draw up a fample of the fubftance from the very bottom of the founding.

If the only thing wanted be to know the nature of the under foil, and layers of earth, fo far as they may effect the vegetation of plants, it will be very fufficient to bore eight or ten feet deep. A greater depth is only requifite when water, marle, ore, &c. be fought for.

The common augre indeed will do very well for fhallow boring, as we have already obferved under that article. *See the article* AUGRE.

By either of thefe inftruments, there is a certainty of difcovering, without much charge, or any hazard, not only what earths are under the upper foil, but alfo whether any other fubftance of value lies concealed there, fuch as marle, chalk, fuller's-earth, foffile fhells, coals, quarries of flate or ftone, ores, &c. many of which are hid, and entirely unthought of in places, where their value, was it known, is ten times more than that of the eftate which covers them.

BORING, an operation fometimes practifed for the cure of horfes, whofe fhoulders are wrenched.

The operation is performed in the following manner: they cut a hole in the fkin in the middle of the fhoulder, and with the fhank of a tobacco-pipe, blow it as a butcher does a fhoulder of veal; then they run a cold flat iron, like a horfeman's fword-blade, eight or ten inches up between the fhoulder blade and the ribs, which they call boring; after that, they burn him round the fhoulder with a hot iron. *Burd. Gent. Far.*

This is a very abfurd and cruel treatment, and can be of no manner of fervice. *Bartlet's Farriery.*

BOSQUETS, fmall groves or compartments in gardens formed by the branches of trees, difpofed either regularly in rows, or wildly and irregularly, according to the fancy of the owner.

BOSTAL, a way up a hill.

BOTTS, a name given to a fpecies of worms infefting horfes and other cattle.

The botts which breed in the ftomachs of horfes, and which are fometimes the caufe of convulfions, appear to be very large maggots, compofed of circular rings, with little fharp prickly feet along the fides of their bellies (like the feet of hog-lice) which, by their fharpnefs, equal to that of the fineft needle, feem to be of ufe to faften them to the part where they breed, and from whence they draw their nourifhment, and alfo to prevent their being loofened from fuch adhefion, before they come to maturity. The eggs from whence thefe botts are produced, are difpofed in clufters round the lower orifice of the ftomach, and are laid under the inner coat, or thin membrane of the ftomach; fo that when the animals come to life, they burft through this inner coat, their breech and tail ftrait outwards, and their trunks fo fixed into the mufcular or flefhy coat of the ftomach, that it fometimes requires a good pull to difengage them: from the blood of this laft coat they draw their nourifhment, which they fuck like fo many leeches, every one ulcerating and purfing up the part where it fixes, like a honey-comb; and they often make fuch quick havock as to deftroy the horfe.

The botts which many horfes are troubled with in the beginning of fummer, are always feen fticking to the ftrait gut, and are often thruft out with the dung, together with a yellowifh coloured matter refembling melted fulphur; they are no ways dangerous there, but are apt to make a horfe reftlefs and uneafy, and rub his breech againft the pofts. The feafon of their coming is in the months of May and June, after which they are feldom to be feen, and rarely continue in any one horfe above a fortnight or three weeks. And the creature may be eafily cured when they are only in the ftrait gut, by giving him a fpoonful of favin cut very fmall, once or twice a day in his oats, or bran, moiftened: three or four cloves of garlic may alfo be added to advantage. The following purge fhould likewife be given:

> Take fine fuccotrine aloes ten drams; frefh jallap one dram; birthwort and myrrh powdered, of each two drams; oil of favin and amber, of each one dram; fyrup of buckthorn enough to form the whole into a ball.

But the botts, which take their lodgement in the ſtomach, are, as has been already obſerved, extremely dangerous, by cauſing convulſions, and are ſeldom diſcovered by any previous ſigns before they come to life, when they throw the horſe into violent agonies. The only cure for theſe is mercurial medicines; the following will anſwer the intention:

> Take quickſilver two drams; Venice turpentine half an ounce; rub the quickſilver till no gliſtening appears; then take an ounce of aloes, a dram of grated ginger, thirty drops of oil of ſavin, and ſyrup of buckthorn enough to make the whole into a ball.

One of theſe balls may be given every ſix days, with the uſual precautions with regard to mercurial phyſic: and the following powders immediately:

> Take powdered tin and Æthiops mineral, of each an ounce; and give it every night in a maſh, or in his corn.

Theſe medicines, or any of the various preparations of antimony and mercury, ſhould be continued ſeveral weeks together, in order to free the animal entirely from theſe vermin. *Bartlet's Farriery, pag.* 150.

BOUDS, a name in ſome countries for the inſects generally called weevils, breeding in malt.

BOW, a name in ſome counties for a yoke.

BOWER, a ſhady place under the covert of trees or branches interwoven. It is either round or ſquare at the bottom, and covered with a ſort of dome at the top.

BOWS *of a ſaddle*, are two pieces of wood laid archwiſe to receive the upper part of the horſe's back, to give the ſaddle its due form, and to keep it ſteady.

BOX, the name of a well known tree, of which botaniſts enumerate ſeven ſpecies; viz. 1. The box-tree. 2. The narrow leaved box-tree. 3. The ſtriped box. 4. The gold-edged box-tree. 5. The dwarf box. 6. The dwarf-ſtriped box. 7. The ſilver-edged box.

The firſt and ſecond ſorts grow in great plenty upon Box-hill near Darking in Surry, where were formerly large trees of theſe kinds: but of late they have been pretty much deſtroyed; yet there are great numbers of theſe trees remaining, which are of a conſiderable bigneſs. The wood of this tree is very uſeful for turners, engravers, and mathematical inſtrument makers; the wood being ſo hard, cloſe, and ponderous, as to ſink in water; which renders it very valuable for divers utenſils.

All the varieties of the trees, or large box, are proper to intermix in clumps of ever-greens, &c. where they add to the variety of ſuch plantations: theſe may be propagated by planting the cuttings in autumn in a ſhady border, obſerving to keep them watered until they have taken root; when they may be tranſplanted into nurſeries, till they are fit for the purpoſes intended. The beſt ſeaſon for removing theſe trees is in October; though, indeed, if care be uſed to take them up with a good ball of earth, they may be tranſplanted almoſt at any time, except in the ſummer: theſe trees are a very great ornament to cold and barren ſoils, where few other things will grow; they may alſo be propagated by laying down the branches, or from ſeeds: the laſt being the beſt method to have them grow to be large, the ſeeds muſt be ſown, ſoon after they are ripe, in a ſhady border, which muſt be duly watered in dry weather.

The dwarf kind of box is uſed for bordering of flower-beds, or borders; for which purpoſe it far exceeds any other plant, it being ſubject to no injuries from cold or heat, and is of a long duration; is very eaſily kept handſome, and, by the firmneſs of its rooting, keeps the mould in the borders from waſhing into the gravel-walks, more effectually than any plant whatever: this is increaſed by parting the roots, or planting the ſlips; but, as it makes ſo great an increaſe of itſelf, and ſo eaſily parts, it is hardly worth while to plant the ſlips that have no roots; but it is now become ſo common, that it may be purchaſed from the nurſeries at a cheap rate. *Miller's Gard. Dict.*

BOX *of a wheel*, the aperture wherein the axis turns.

BOX *of a plough*, the croſs-piece in the head of a plough which ſupports the two crow-ſtaves. *See* PLOUGH.

BRACE, a general name for a couple, or pair of any thing, as bucks, hounds, partridges, &c.

BRACE alſo ſignifies a piece of timber framed into the beams, &c. with bevel joints, to keep the building from ſwagging either way.

BRACKEN, the ſame with brakes, or fern. *See the article* FERN.

BRACKET, a kind of wooden ſtay, ſerving to ſupport ſhelves and the like.

BRAGGET, or BRAKET, a ſort of compound drink, made with honey, ſpices, &c.

BRAKE, the ſame with fern. *See the article* FERN. It is likewiſe applied to the place where fern grows.

BRAKE, is alſo a name given to an inſtrument often uſed by farriers, &c. generally called barnacles. *See* BARNACLES.

BRAKE *of a pump*, ſignifies the handle wherewith it is wrought.

BRAKE, is likewiſe the name of a wooden-toothed inſtrument, uſed to bruiſe and break the bun of hemp, and ſeparate it from the rind. *See the article* HEMP.

BRAN, the ſkin or huſks of corn, eſpecially wheat, ground and ſeparated from the flour by means of a ſearch or boulter.

Bran is a uſeful ingredient in a horſe's diet, if diſcreetly uſed, and when ſcalded is a kind of panada for ſick horſes. But nothing is worſe than a continual uſe of bran raw or ſcalded, as it is apt to weaken a horſe's bowels, and thereby expoſe them to many diſorders. *Gibſon on the Diſeaſes of Horſes, vol.* I. *pag.* 172.

Mr. Mills aſſures us, that a little wheat bran boiled in our ordinary beer, will make it mantle in the cup. *Huſbandry, vol.* I. *pag.* 407.

BRANCH, an arm of a tree, or a part which ſprouting out from the trunk, helps to form the head or crown.

As branches have their outward parts common with the chief ſtem, ſo in like manner do their inward conſiſt of a multitude of tubes, which are alſo provided with a number of ſmall glands, veins, and muſcles, interſperſed here and there, where the ſap coming from the firſt canal is rendered much more delicate.

Branches are diſtinguiſhed into various kinds: 1. Wood-branches, which are thoſe that form the ſhape of the tree, and are to be pruned from four to twelve inches, according to the vigour of the tree. 2. Fruit-branches, which are ſlenderer than the wood-branches, and have their eyes near to one another and large, by which the fruit-buds are formed. If they are too long, they are to be topped; but if they are of a juſt length, they are to be preſerved, only juſt cutting off the extremity. 3. Branch half-wood, that which, being too ſlender for a wood-branch, and too big for a fruit-branch, is cut off at the length of two or three inches, to make it produce a better ſhoot, whether wood or fruit. 4. Irregular branches, which are ſmall and confuſed: they muſt be cut off, becauſe they are neither fit for wood nor fruit. 5. Branches of falſe wood: theſe are ſuch as grow upon the true wood-branches, and have flat eyes at a diſtance one from another; for which reaſon they are uſeleſ, and therefore muſt be cut off. 6. Luxuriant branches, which are ſuch as ſhoot out from the large wood-branches: theſe are as taper and as big about as one's finger, the back being ſmooth and even, and having broad eyes at a diſtance from one another: theſe muſt all be cut off. 7. Spurious wood-branches, ſuch as come contrary to the order of nature, or otherwiſe than from the cuts of the preceding year; or which, coming on ſuch cuts, are big in the place where they ſhould be ſmall.

The diſtinguiſhing marks of good branches are, that the eyes, in the whole extent, be thick, well-fed, and very cloſe one to another. The good ſtrong branches are employed in producing yearly, on their extremities, other new branches, ſome ſtrong and others weak. The good weak branches are ſuch as are well placed, and being of a mean thickneſs and length, may be able to produce ſpeedily beautiful and good fruit.

The diſtinguiſhing marks of bad branches are, when in the lower part the eyes are flat, ill-fed, and hardly formed, and at a large diſtance one from another. See the article PRUNING.

BRANK,

BRANK, the ſame with buckwheat. See the article BUCKWHEAT.

BRANT, a ſteep, riſing with a conſiderable inclination.

BRAWN, the fleſh of a boar, boned, rolled up, or collared, boiled, and laſtly pickled.

Brawn is made only of the flitches, without the legs: the oldeſt boars are choſen for this uſe, it being a rule, that the older the boar the more horny the brawn.

The method of making it is as follows: the bones being taken out of the flitches, the fleſh is ſprinkled with ſalt, and laid in a tray, that the blood may drain off; after which it is ſalted a little, and rolled up as hard as poſſible. The length of the collar of brawn ſhould be as much as one ſide of the bone will bear; ſo that when rolled up it may be nine or ten inches in diameter.

The collar being thus rolled up, it is boiled in a copper or large kettle, till it is ſo tender that you may run a ſtraw through it; when it is ſet by till thoroughly cold, and then put into the following pickle. To every gallon of water add two handfuls of ſalt, and as much wheat-bran: boil them together, drain the liquor as clear as poſſible from the bran, and when the liquor is quite cold, put the brawn into it.

BREAD, a well-known food chiefly divided into white, wheaten, and houſhold; differing only in degrees of purity. In the firſt, all the bran is ſeparated; in the ſecond, only the coarſer; in the third, none at all: ſo that fine bread is made only of flour; wheaten bread of flour, with a mixture of fine bran; and houſhold, of the whole ſubſtance of the grain, without taking out either the coarſe bran, or fine flour.

We alſo meet with ſymnel bread, manchet or roll bread, and French bread: which are only ſo many denominations of the fineſt or whiteſt bread, made of the pureſt flour; except that in roll bread there is an addition of milk, and, in French bread, of eggs and butter alſo. To which may be added, ginger-bread, made of white bread, with almonds, liquorice, aniſeed, roſe-water, and ſugar; and maſlin bread, made of wheat and rye, or ſometimes of wheat and barley.

The proceſs of making houſhold bread amongſt us, is thus: to a peck of meal they add a handful of ſalt, a pint of yeaſt, and three quarts of water, cold in ſummer, hot in winter, and temperate between the two; the whole, being kneaded in a bowl or trough by the fire in winter, from it in ſummer, and a little yeaſt added, will riſe in about an hour; they then mould it into loaves, and put it into the oven to bake. *Hought. Collect.*

For leavened bread, part of the flour intended for it, being made into dough with warm water and a little ſalt, is laid in the reſt of the flour an hour or more, in which time it riſes to three times the bulk; then they mix and knead the whole with more water, till it be brought into a ſtiff dough; which, being formed into loaves, is baked in the oven: though the more uſual way is to take a piece of dough kneaded, and leave it in the tub till next time, when they break it ſmall, and mix it with the meal, adding ſome yeaſt. *Hought. Collect.*

For French bread, they take half a buſhel of fine flour, ten eggs, and a pound and a half of freſh butter, into which they put as much yeaſt, with manchet; and, tempering the whole maſs with new milk, pretty hot, let it lie half an hour to riſe; which done, they make it into loaves or rolls, and waſh it over with an egg beaten with milk: care is taken the oven be not too hot. *Ruſt. Dict.*

BREAK, land ploughed the firſt time after it has lain fallow in ſheep walks.

BREAST-PLOUGH, a ſmall plough contrived ſo that a man may ſhove it before him. It conſiſts of a cutting iron about eight or nine inches long, and having one of its ſides turned up to cut the turf. This iron is fixed to a pole bending upward about five or ſix feet long, and forked at the upper-end, having a crutch, or croſs handle, mortiſed into the forks. Againſt this crutch the ploughman places his breaſt, and ſhoves along the plough in order to turn up the turf, its only uſe being for cutting up the ſurface of the ground in the operation called burn-baking. See the article BURN-BAKING.

BRECK, *or* BRACK, a breach or gap made in a hedge

BREW-HOUSE, a houſe erected for the purpoſes of brewing.

The conveniency of water is one of the firſt things to be attended to in erecting a brew-houſe, becauſe the frequent carriage of that neceſſary fluid greatly enhances the coſt of the beer. The water ſhould be ſoft, and if ſupplied from an adjacent river, it ſhould be conveyed by a paſſage under-ground, in order to its being pumped up from thence into the copper, or into troughs properly placed for carrying it where it may be wanted. If there be a reſervoir for rain-water, it ſhould be made as near the brew-houſe as poſſible.

The brew-houſe ſhould be ſo ſituated as to face the north, for ſhade and coolneſs. It ſhould be as near as poſſible to the cellar, that the labour and expence attending the carriage of the liquor may be ſaved, and the danger of expoſing it to either too hot, or too cold an air prevented. The floor ſhould be paved with ſtone or hard bricks, and raiſed in the middle, to give an eaſy diſcharge to the water, ſo as to keep the brew-houſe always clean.

The copper ſhould be proportioned to the quantity brewed, and ſhould be raiſed ſo high that the water may run from it to the maſh-tub, and the wort to the coolers. For this purpoſe there ſhould be either a cock in the ſide at the bottom of the copper, or a braſs pump ſhould be fixed to its ſide, by means of which the water or wort may be conveyed through a trough to their proper receptacles.

The maſh-tub ſhould be round, not too deep, and perfectly ſmooth on the inſide. It ſhould have a falſe bottom, which may ſerve as a ſtrainer, when by turning a cock placed below, the wort may be drawn off into the receiver: or the wort may be let out by means of an upright plug ſurrounded with a baſket-ſtrainer.

The receiver ſhould be lined with milled lead, which is eaſily kept perfectly clean, and is not apt to contract any bad taſte or ſcent, as wood is known to do, notwithſtanding the greateſt care. The beſt method of conveying the wort from the receiver to the copper is by means of a hand-pump.

There ſhould be two coolers, or backs, as the brewers call them. Theſe ſhould alſo be lined with milled lead, or made of the heart of oak rendered perfectly ſmooth; and placed as near as convenient to the copper.

The working veſſel or tun ſhould be placed at ſome ſmall diſtance from the cooler. It ſhould be round, but not lined with lead; becauſe this would cool the liquor too much in cold weather, during the fermentation.

The cellar ſhould, as already obſerved, be near, if poſſible, and ſunk much lower than the working-tun, that the beer may be conveyed into the caſks by a cock and hoſe, or ſome other eaſy method.

There muſt be in the brew-houſe an oar to ſtir the malt in the maſh-tub, with bowls, pails, and other utenſils, neceſſary in different operations. Theſe, as well as every other implement employed in brewing, ſhould be boiled in the copper, or well ſcalded every time before they are uſed.

Too great care cannot be taken to keep every veſſel perfectly clean and ſweet: for if they are the leaſt tainted, the liquor will contract a diſagreeable ſcent. When any taint is ſuſpected, the veſſels ſhould be well waſhed with a ſtrong leye of clean wood-aſhes. This leye ſhould be put into them ſcalding hot, and every joint, crevice, and ſmalleſt hollow muſt be well ſcrubbed. If there are no aſhes to be had, lime may be ſlaked in water in the veſſels; and if this be done in caſks, they may be bunged up as ſoon as the ebullition is over, and not opened till three days after. The more effectually to prevent the lodging of any kind of filth, the ſides of every veſſel ſhould be as ſmooth as poſſible; and after every brewing they ſhould be waſhed with boiling water, and laid up dry.

BREWING, the operation of preparing beer, or ale, from malt and hops.

The uſual proceſs of brewing is as follows: the ingredients being ready, the water muſt be made to boil very ſpeedily, and while boiling with the greateſt violence, the fire muſt be immediately damped, or put out; when the height of the ſteam is over, the water is put into the maſhing-tub, to wet the malt; then ſo much being poured out, as to make it of a conſiſtence ſtiff enough to be rowed up, let it ſtand thus a quarter of an hour, after which another quantity of water is added, and rowed up as before; at laſt the full quantity of the water is poured upon it, and that in proportion as the liquor is intended to be ſtrong

or

or weak: this part of the operation is called mafhing. Afterwards the whole may be left to ftand two or three hours, more or lefs, according to the ftrength of the wort, or the difference of the weather; then let it run into the receiver, and mafh again for a fecond wort, in the fame manner as for the firft, only the water muft be cooler, and muft not ftand above half the time.

The two worts being mixed together, the quantity of hops that is defigned may be added thereto, and the liquor put into the copper, which being cofely covered up, let it boil gently for the fpace of an hour or two; then let the liquor into the receiver, and the hops ftrained from it into the coolers.

When cool, the barm is applied; which done, it is left to work, or ferment, till it be fit to tun up.

For fmall-beer there muft be a third mafhing; the water muft be near cold, and to ftand not above three quarters of an hour; to be hopped and boiled at difcretion.

Such is the procefs, as commonly delivered, for brewing; but it is in many particulars fo vague and uncertain, that proper explanations will be requifite.

The malt is ordered to be put into the mafh-tub, when the height of the fteam is over; but how is this to be known exactly? Some direct you to ftay till you can fee your face in the water, which is full as equivocal. Perhaps the method propofed by Dr. Shaw might anfwer the purpofe. He directs us to put a certain meafured quantity of cold water to the malt firft, and ftir that very well with it, fo as to from a kind of thin uniform pafte; after which the remaining quantity of the water may be added in a ftate of boiling, without the leaft danger. By this means, adds that able chemift, the proper or precife degree of heat, neceffary to extract the virtue of the malt with all advantages, may be very expeditioufly hit, or affigned, to a great exactnefs; as the heat of boiling water is a ftandard, which may at once be let down to any defired point of warmth, by a proper addition of cold water; due allowance being made for the feafon of the year, and the temperature of the air.

To employ only one copper in brewing is generally allowed to be bad management; becaufe the bufinefs muft, in that cafe, ftand ftill in fome part or the other, however well the procefs may be contrived. For this reafon, the beft and more ufual method is to brew with two coppers.

The great copper in which the water for the two firft extracts receive their temperature, is built very near the mafh-tub, fo that the water may be readily conveyed to the ground malt. At the bottom of the copper is fixed a cock, which being turned, lets the water run through a pipe to the real bottom of the mafh-tub. This is by far the beft way, becaufe it is the moft expeditious, and leaft liable to accidents.

When the water has been brought to a proper degree of heat in the mafh-tub, the malt is run very leifurely into it, whilft another perfon ftirs it all the time, fo as to mix the whole of it uniformly with the water, and prevent any of its parts from gathering into clods. In this operation rakes fhould be firft employed; becaufe by their horizontal motion, lefs violent than that of mafhing, the fineft parts of the malt are well wetted, without its flour being fcattered or loft in the air: but as a ftill more perfect penetration and mixture are neceffary, oars are afterwards ufed, by which a thorough inhibition of the water is effected. When the mafh has been fufficiently ftirred, it is covered with a fprinkling of malt, and the tub itfelf fhould alfo be covered with facks or other cloths to keep it warm.

After mafhing, the malt and water are left untouched for an hour and a half, or two hours; and during this interval, the large copper of water is brought to a proper heat for a fecond mafhing. The fecond extract is commonly mafhed three quarters of an hour, and is afterwards let ftand the fame fpace of time; and the third requires half an hour, both for mafhing and ftanding. As the firft drawn wort is immediately put into the large copper, the water for the third mafhing is boiled in the fmaller.

Small quantities of malt brewed in large veffels lofe their heat fooneft by lying thin and greatly expofed to the action of the air; and, on the contrary, a lefs allowance for the lofs of heat is required for large quantities brewed in proportionable veffels. This is the only difference between brewings carried on in large brew-houfes, and thofe which are made in private families. Care fhould be taken that the quantity of malt be not fo large as to exceed the bounds of one man's labour; nor fo fmall as to prevent the heat being uniformly maintained. It is alfo of great importance never to let the malt remain with lefs water than will cover it.

It is the general cuftom in private families to brew their fmall-beer after their ale: but they may be affured that if they have any regard to their fmall-beer, it is their intereft to brew it alone; for the beer thus made is incompably better, becaufe it then contains all the flavour of the malt, is undoubtedly more wholefome, and will keep much longer.

A correfpondent of the editors of the *Mufeum Rufticum*, vol. vi. p. 287, has given the following ufeful directions for making a kind of fmall-beer, which for cheapnefs, agreeablenefs, and perhaps wholefomenefs, is greatly preferable to that made from malt. It has alfo this further advantage, that it may be made ready for drinking in three or four days time.

The method is this: take of water fifteen gallons; and boil one half of it in any copper or pot that may be at hand. Put the part of the water thus boiled, while in its full heat, to the cold part contained in a barrel or cafk: and then add one gallon of melaffes, commonly called treacle, ftirring them well together. If the veffel be new, add a little yeaft; but if it has been ufed before for the fame purpofe, the yeaft will be unneceffary. Keep the bung-hole open for a day or two, till the fermentation appears to be abated, and then clofe it up. The beer will in a day or two afterwards be fit to drink.

But to return to the management of the wort. The beer-wort muft be boiled, in order to free it from particles which would render the liquor muddy and ill coloured, without adding to its ftrength; to extract the virtue of the hops; and to render the drink fitter for keeping.

Worts, like every other fweet vegetable juice, when once brought to ferment, are fo inclined to continue their fermentation, that it is difficult to retard their progrefs therein, to keep their prefervative qualities, and fo hinder them from turning acid. Among the many methods put in practice to retard this forwardnefs of the worts, none promifed fo much fuccafs as blending with them the juice of fuch vegetables as are not of themfelves eafily fermented. Hops are felected for this purpofe; and experience, which has proved their wholefomenefs, has alfo demonftrated their efficacy: for their refinous parts retard the aptnefs of malt liquors to ferment. By this means they keep malt-liquors found a longer time, and by repeated and flow frettings, give an opportunity to the particles of the liquor to be more feparated and comminuted, than they would otherwife be. Fermented liquors require hereby a greater pungency, fo that, even if they did not receive an additional ftrength from this ingredient, hops would be the means of improving their tafte.

The aromatic parts of hops are volatile, and a fmall heat difengages them from the plant. To preferve thefe parts in the procefs of brewing, the hops fhould be put into the copper as foon as poffible, and be thoroughly heated while the heat of the wort is at the leaft, and the fire under the copper has no effect there. Whoever will take the trouble of feeing this performed, will be convinced that the flavour of the hops is retained; inftead of being diffipated in the air, as it always is, when the wort is firft fuffered to boil.

In order to extract more gradually a fragrant tincture from the hops, they fhould be rubbed thoroughly between the hands, and then put into a bag or fine net, fo loofe that the wort may be eafily admitted among them, and in this ftate they fhould be placed in the receiver or under-back, fo that the wort may run upon them. After this gradual foaking, during which they will communicate much of their virtue to the wort, lefs boiling will ferve, and the beer will have their full flavour.

A correfpondent of the editors of the *Mufeum Rufticum*, vol. III. pag. 64, has made fome judicious remarks on the common practice of boiling the hops in the wort. He obferves that the rich, fat wort fheaths up the pores of the hop, and, as it were, embalms the leaves, fo that the beer or ale-wort can extract a very fmall part only of the neceffary quality of the hop: but

but when it is put into the ſmall beer, a fluid of a thinner nature, the pores are unſheathed; ſo that the latter becomes too bitter, while the former has hardly any taſte of the hop. To remove theſe inconveniencies, he propoſes to ſoak the hops previouſly in a pail or two of hot water, by which means the hop will impart its good qualities impartially, and both the ſtrong and ſmall beer obtain a grateful bitter. And with regard to the quantity of water uſed in ſoaking the hops, allowance may be made for it in the firſt quantity.

When the firſt wort is ſufficiently boiled, it is conveyed into the coolers; and if the hops are not contained in a net, it muſt be run through a ſieve or ſtrainer, to keep them back. If the coolers have not been perfectly cleaned from the ſediment of former worts, which is very apt to inſinuate itſelf into old or decayed wood, the wort intended to be cooled in them, will, before it is removed, contract from that ſediment a degree of fermentation. This accident generally happens in a little more than twelve hours after the putting in of the wort; and therefore may be eaſily prevented by not letting the wort continue ſo long in the coolers.

When the wort is of a proper degree of coolneſs, the yeaſt is generally put into a large bowl, and a little of the wort juſt warm is added to it. The yeaſt ſwims at firſt on the ſurface, but ſoon blends itſelf with the wort, and begins the fermentation. As ſoon as this happens, the whole is mixed with the wort in the working tun.

If the fermentation ſhould not riſe properly, a little of the fineſt wheat flour ſifted over the wort, ſo as to cover the whole ſurface of the liquor, will, by forming a kind of artificial head, confine the air, and ſoon produce the effect deſired. If a greater degree of warmth ſhould be wanted, a ſtone jug filled with boiling water, and put into the wort, will communicate a gentle heat to the whole, and as the liquor warms, the fermentation will come on in a gradual and proper manner.

In the courſe of the fermentation, it may ſometimes be neceſſary, in order to quicken it, to beat in the yeaſt, or rather to ſtir it with a whiſk, which ſhould be perfectly clean, ſcalded in boiling water, and then wiped dry. It will alſo by this means retain ſome degree of warmth, which will likewiſe help to promote the fermentation. Theſe meaſures, with an additional warmth given to the air, and warm coverings laid over the working tun, ſeldom fail to anſwer the end deſired.

If the fermentation proceeds too violently, owing to the warmth of the weather, or too great quantity of yeaſt, the beſt way of checking it is, to cool the air, by giving it a more free admiſſion, and to mix a little cold wort with the fermenting liquor. The practice of adding ſome unctuous ſubſtance is bad, and therefore ſhould be rejected.

Care ſhould be taken to have the caſks in good order againſt the time that the fermentation is completed in the tub; that is, they ſhould be tight and clean, and perfectly free from filth or ſmell; for if they have either of theſe defects, the whole labour will be loſt, becauſe the excellency and fine flavour of the liquor will be deſtroyed.

The perfection of malt liquors depends not only on the proportion of the oils to the ſalts, and on the proportion of hops uſed in brewing, but alſo on the fermentation's being carried on ſlowly and cooly. For this reaſon cool weather is beſt for brewing of beer intended for long keeping. If therefore the liquor be not drawn off before the fermentation has proceeded too far, ſome of the coarſer oils will return into the liquor, and give it a diſagreeable and greaſy taſte. On the contrary, if the fermentation has not been continued its due time, the impurities which would either have ſunk down in the lees, or have been thrown up with the head, will remain in the liquor, and prevent its becoming clear and well taſted.

When the fermentation is at its height, all the dirt or foul yeaſt, which riſes on the ſurface, muſt be carefully ſkimmed off.

When the fermentation begins to ſubſide after the liquor has been drawn off into the caſk, the caſk ſhould be filled up with a reſerve of the ſame liquor taken from another veſſel, but by no means with that which runs over.

When the fermentation has ceaſed, the caſk being filled up, ſhould be bunged cloſe down, leaving the vent-hole open, or but ſlightly covered, till all motion in the liquor is ſubſided; and after this is over, the vent-hole ſhould be ſtopped quite cloſe. The cuſtom of uſing bungs made of cork is wrong. A wooden bung ſhould be fitted to the bung-hole as exactly as poſſible, and covered with a clean cloth.

BRIDLE, a contrivance made of ſtraps or thongs of leather, and pieces of iron, in order to keep a horſe in ſubjection and obedience.

The ſeveral parts of a bridle are, the bit or ſnaffle, the head-ſtall, or leather from the top of the head to the rings of the bit; the fillet, over the forehead and under the foretop; the throat-band, which buckles from the head-band under the throat; the noſe-bands, going through the loops at the back of the head-ſtall, and buckled under the cheeks; the reins or long thongs of leather that come from the rings of the bit, and being caſt over the horſe's head, the rider holds in his hand.

Bridle-*hand*, is the horſeman's left-hand, the right being called the ſpear or ſword-hand.

BRIM, or Brimme, a word applied to a ſow when ſhe goes to the boar, which is called going to brim.

BRINE, pickle, or water replete with ſaline particles.

BRINING *of hay reeks*, a practice common in America, and conſiſts in mixing ſalt with the hay as they ſtack it.

A correſpondent of the editors of the *Muſeum Ruſticum* recommends this practice greatly, declaring that hay which has to all appearance been ſpoiled by the rain, will ſpend as well as that made and ricked in the fineſt weather.

"Juſt before I left America, ſays he, I had a crop of hay, which was in a manner ſpoiled by the rain, being almoſt rotted in the field; yet did this hay ſpend as well as if it had been got in ever ſo favourably.

"When my ſervants were making up the ſtack, I had it managed in the following manner; as ſoon as the bed of hay was laid about ſix inches thick, I had the whole ſprinkled over with ſalt; then another bed of hay was laid, which was again ſprinkled in the ſame manner; and this method was followed till all the hay was ſtacked.

"When the ſeaſon came for cutting this hay, and giving it to my cattle, I found that ſo far from refuſing it, they eat it with ſurprizing appetite; always preferring it to the ſweeteſt hay, that had not been in this manner ſprinkled with ſalt." *Muſeum Ruſt. vol.* II. *pag.* 210.

BRITE, a word applied to hops when they are over ripe or ſhatter, in which caſe they are ſaid to brite.

BROAD-WHEELED *waggon*. *See the article* Waggon.

BROCOLI, or Broccoli, a ſpecies of cabbage, of which there are ſeveral varieties. *See the article* Cabbage.

Brocoli requires a very good and pretty light ſoil, rather deep than otherwiſe. The proper time for ſowing it is from the latter end of April, till the beginning of June; and the manner the ſame as for cabbage. When the plants are about a fortnight or three weeks old, that is when they have got ſeven or eight leaves, they ſhould, like all others of the cabbage kind, be tranſplanted into beds of well prepared mould, and towards the end of July they will be fit to be tranſplanted into beds where they are to remain. This ſhould be a well ſheltered ſpot, but not under the drip of trees. The plants ſhould here be ſet in rows at leaſt two feet aſunder, but two feet and a half, or even three feet, will be ſtill better; and at the diſtance of a foot and a half, or rather two feet from each other in the rows. Towards the end of December, if the weather be not very ſevere, they will begin to ſhew their ſmall heads, which, eſpecially at their firſt appearance, are not unlike thoſe of cauliflowers. Theſe heads ſhould be cut off before they run up to ſeed, with about four or five inches of the ſtalks, and a great number of ſide ſhoots, produced from the ſtem, will ſucceed them, and continue fit for eating till the

the middle of March. They will not indeed be fo large as the former, but they will be equally well tafted. The fkin of the ftalks fhould be taken off before they are boiled.

There are three forts of brocoli cultivated in our kitchen gardens, viz. The Roman or purple brocoli; the Naples, or white brocoli; and the brown or black brocoli. The firft of thefe is the fineft flavoured, and continues longeft in feafon; and therefore is moft efteemed. The fecond, or white brocoli, has fo nearly the tafte of cauliflower, that it is not always eafy to diftinguifh them. The brown or black fort is the leaft delicate; but the hardieft, and grows to the largeft fize.

For a fecond crop to fupply the table after the firft is gone, Mr. Miller advifes the fowing of brocoli again in the beginning of July; but Mr. Switzer thinks it wrong to fow this plant even fo late as Midfummer, becaufe their ftems will not be ftrong enough before the winter to produce that number of fprouts they otherwife would do, if fown fooner. He therefore directs the plants to be divided into three parts, and to cut their heads off entirely within a foot and a half, or two feet of the ground; beginning to do this to one parcel about a fortnight before Michaelmas, to the next about a month after, and to the laft about a fortnight or three weeks before Chriftmas: by which means a continued fucceffion of fprouts will iffue from the fides of the remaining ftems. Either directions may be followed; but the largeft heads will be produced by Mr. Miller's method, and the greateft number by that of Mr. Switzer. *Miller's Gard. Dict. Switzer's Method of raifing Italian Brocoli*, &c. *pag.* 2.

BROKEN-WIND, a very fatal difeafe to which horfes are too often fubject.

This diforder hitherto feems to have been little underftood; but Mr. Gibfon is inclined to think, that the fource of it is frequently owing to injudicious, or hafty feeding young horfes for fale; by which means the growth of the lungs, and all the contents within the cheft, are fo increafed, and, in a few years, fo preternaturally enlarged, that the cavity of the cheft is not capacious enough for them to expand themfelves, and perform their functions.

A narrow contracted cheft with large lungs may fometimes naturally be the caufe of this diforder: and it has been obferved, that horfes rifing eight years old, are as liable to this diftemper, as at a certain period of life, men fall into afthmas, confumptions, and other chronic difeafes.

The reafon why this diforder becomes more apparent at this age may be, that a horfe comes to his full ftrength and maturity at this time: at fix he commonly finifhes his growth in height; after which he lets down his belly, and fpreads, and all his parts are grown to their full extent; fo that the preffure on the lungs and midriff is now more increafed.

But how little weight foever thefe reafons may have, repeated diffections have given ocular proofs of a preternatural largenefs, not only of the lungs of broken-winded horfes, but of their heart and its bag; and alfo of the membrane which divides the cheft; as well as of the remarkable thinnefs of the diaphragm or midriff.

This difproportion has been obferved to be fo great, that the heart and lungs have been almoft of twice their natural fize; perfectly found, and without any ulceration whatever, or any defect in the wind-pipe or its glands.

Hence it appears, that this enormous fize of the lungs, and the fpace they occupy, by hindering the free action of the midriff, is the chief caufe of this diforder; and as the fubftance of the lungs was found more flefhy than ufual, they muft of courfe have loft much of their fpring and tone.

This flefhinefs and fize of the lungs may, in a great meafure, be the caufe, why the infpirations in broken-winded horfes are difproportionately flow; for we may obferve that they draw their in breath flowly, their flanks filling up, and rifing with difficulty: but that their flanks fall fuddenly, and their breath burfts forth with violence, both from mouth and noftrils; infomuch, that a man in the dark, by holding his hands on the horfe's mouth and nofe, may eafily difcover if he is broken-winded.

Whoever confiders a broken-wind in this light, muft own that it may be reckoned among the incurable diftempers of horfes; and that all the boafted pretenfions to cure, are vain and frivolous, fince the utmoft fkill can amount to no more than now and then palliating the fymptoms, and mitigating their violence.

We fhall therefore lay down fuch methods as may probably prevent this diforder, when purfued in time; but if they fhould not fucceed, we fhall offer fome remedies and rules to mitigate its force, and to make a a horfe as ufeful as poffible under this malady.

It is ufual before a broken-wind appears, for a horfe to have a dry obftinate cough, without any vifible ficknefs or lofs of appetite; but, on the contrary, a difpofition to foul feeding, eating the litter, and drinking much water.

In order then to prevent, as much as poffible, this diforder, bleed him, and give him two drams of calomel, mixed up with an ounce of diapente, for two nights fucceffively, keeping him cloathed and well littered; and feeding him with fcalded bran and warm water.

The following balls are then to be taken for fome time, which have been found extremely efficacious in removing obftinate coughs:

> Take gum ammoniacum, galbanum, and affa fœtida, of each two ounces; fquills, four ounces; cinnabar of antimony, fix ounces; faffron, half an ounce: make the whole into a pafte with honey; and give a ball about the fize of a pullet's egg every morning.

Broken-winded horfes fhould eat fparingly of hay, which, as well as their corn, may be wetted with chamber-lye, or fair water; as this will make them lefs craving after water.

The volatile falts in the urine may render it preferable to water, and may be the reafon why garlic is found fo very efficacious in thefe cafes; two or three cloves given at a time in a feed, or three ounces of garlic bruifed, and boiled in a quart of milk and water, and given every other morning for a fortnight, having been found very ferviceable; for by warming and ftimulating the folids, and diffolving the tenacious juices, which choak up the veffels of the lungs, thefe complaints are greatly relieved.

Careful feeding and moderate exercife has greatly relieved broken-winded horfes; and though for the firft fummer they have not been able to endure much labour, yet many have been found lefs oppreffed the fecond, and fome fcarce perceptibly affected the third; and even able to bear great fatigue: and could a horfe be kept conftantly in the field, and taken up only when ufed, he might, by this management, do good fervice for many years.

But whoever expects to cure his horfe by fending him out to grafs, will find himfelf difappointed, efpecially if he remains abroad after the fpring grafs; for on his return to the ftable and dry meat, he will be more oppreffed and fhort breathed than before, for want of the open air, and the moift food he has been accuftomed to.

Horfes fent to grafs in order to be cured of an obftinate cough, have often returned completely broken-winded, where the pafture has been rich and fucculent, fo that they have had their bellies conftantly full. As the ill confequence therefore is obvious, where you have not the convenience of turning out your horfe for a conftancy, you may foil him for a month or two with young green barley, tares, or any other young herbage.

To purfive, thick winded horfes, Barbadoes and common tar have often been given with fuccefs, to the quantity of two fpoonfuls mixed with the yolk of an egg, diffolved in warm ale, and given fafting two or three times a week, efpecially on thofe days you hunt or travel.

But in order to make all thefe forts of horfes of any real fervice, the grand point is to have a particular regard to their diet, obferving a juft œconomy both in

that

that and their exercise; giving them but a moderate quantity of hay, corn, or water, at a time, and moistening the former to prevent their requiring too much of the latter, and never exercising them but with moderation, as has been before observed.

The following ball may be given once a fortnight or three weeks; and as it operates very gently, and requires no confinement, except the days it is given (when warm meat and water will be necessary) it may be continued for two or three months.

> Take succotrine aloes, six drams; myrrh, galbanum, and ammoniacum, of each two drams; bay berries, half an ounce; oil of amber, a spoonful: make the whole into a ball with a sufficient quantity of syrup of buckthorn. *Bartlet's Farriery, pag.* 68.

BROODING, the act of a hen, or other bird, sitting on a number of eggs, to keep them warm, till they hatch, or produce young ones.

BROOM, the name of a plant, of which two species are natives of this country, called the common and the small broom.

The common broom is the *genista trifolia* of Mr. Ray. It rises about three feet in height, with shrubby stalks, garnished with spear-like leaves, and terminated by loose spikes of yellow flowers, succeeded by short pods, which turn black when ripe, and contain four or five kidney-shaped seeds. It flowers in June or July, and the seeds ripen in autumn. The flowers of this plant are used by the dyers to give a yellow colour; whence it is called dyers broom, green-wood, wood-waxen, or dyers weed.

The small English broom, called also petty-whin, is the *genista spartium minus Anglicum*, of Tournefort. It rises like the former, with a shrubby stalk, but only to the height of about two feet, sending out many slender branches, which are armed with long single spikes, and garnished with very small spear-shaped leaves, placed alternately on every side of the branches. The flowers branch out without spines, short, and have five or six yellow flowers growing in a cluster at the end. They come out in April and May, and are succeeded by short turgid pods, containing four or five small kidney-shaped seeds, which ripen in July. This sort grows naturally upon open heaths, in many parts of England.

The twigs of broom are excellent for thatching barns, &c. being very tough, and of long duration. Ropes also, and those not bad ones, are made of the stringy fibres of this plant, of which the ancients used also to make a kind of flax.

According to Mr. Bradley's calculation, an acre of of broom is worth upwards of six pounds annually, for the feeding of bees only, besides the wythes and stumps, which will pay for the rent of the land. Certain it is, that no flowers are more pleasing, or more profitable to bees, than those of broom.

But considered as a weed, is one of the most pernicious plants that grows upon the land; for its roots penetrate deep, and, at the same time it sheds no leaves, so that it is continually sucking the moisture from the earth. The best method of destroying it, is by burning the land, then ploughing it deep, and manuring it very well with dung and ashes; or by spreading on the land chalk or marle, or manuring it with urine. If the ground be designed for pasture land, it is best to cut the broom close to the ground in May, when the sap is strong in it. By this artifice the roots are destroyed; whereas in the common way of pulling up the young plants, some strings of the roots will be left, and the least of these will grow. Foddering of cattle upon broomy land is one very good way of destroying the broom, their urine killing the roots, and their treading the land makes it less proper for the roots to extend themselves; for broom is seldom seen to grow near old paths. *Bradley's Husbandry, vol.* I. *pag.* 181. *Mortimer's Husbandry, vol.* I. *pag.* 308. *Mills's Husbandry, vol.* III. *pag.* 361.

BROWN, a dusky kind of colour, inclining somewhat towards redness.

A brown horse is not reckoned altogether so beautiful as the bay or chesnut. There are also degrees of this colour, some being light, and others very dark. They have almost always black manes and tails, and often their joints are black, though not so shining as the bays, but rusty. Almost all brown horses grow gradually lighter towards their bellies and flanks, and many are light about their muzzles. The most beautiful are those which happen to be finely dappled, for the plain brown are esteemed more ordinary. Many of them are coarse, but strong and serviceable, fit for draught, for burden, or for war. *Gibson on Horses, vol.* I. *pag.* 46.

BROWN-STOUT, a name given in some parts to strong brown beer, brewed from brown high-dried malt.

BROWSE, branches fit for the food of goats, &c.

BRUISE, a hurt caused by the force of something blunt and heavy.

Horses and other cattle are very subject to bruises from various accidents; but as the blood is no ways affected in these cases, one general method of cure is only necessary; and that is by coolers and repellers, such as white wine vinegar, old verjuice, or compositions made with alum, vitriol, and the like, which should be applied frequently to the swelling, till the heat and inflammation is abated.

BUCK-BEAN, or *Marsh-trefoil*, *trifolium palustre*, a plant with large oval leaves, pointed at each end like those of the garden bean, set three together on long pedicles, which embrace the stalk to some height, and there parting, leave it naked near the top, where issues a short spike of pretty large, reddish, monopetalous flowers, each of which is cut into five segments, hairy on the inside, and followed by an oval seed-vessel. It is perennial, grows wild in marshy places, and flowers in May.

Sheep, when sound and in health, always avoid eating buck-bean; but when the symptoms of the rot begin to attack them, they search for it by instinct, and devour it greedily. Where such sheep are pastured, no buck-bean is to be found, for in a week or two they devour it all. Might it not be prudent, therefore, in husbandmen, who graze large flocks, to cultivate an acre of this plant in some morassy ground, which otherwise would not yield them two shillings the acre? Some might be cut up green, for unsound sheep, and given them with lucern, as occasion requires; and some might be made into hay, and mixed with their fodder. I cannot remember that this advice has been given by any husbandry writer. *Essays in Husbandry, Essay* II. *pag.* 137.

BUCK-WHEAT, the name of a plant generally considered as a species of corn, though not such in fact; nor does it grow like any of the esculent grains. Its leaf, from being roundish at first, takes nearly the shape of that of ivy, but longer pointed, and much softer. Its stalk is round, hollow, and weak, sometimes reddish, but most commonly green, and growing to the height of about two feet and a half. Lateral branches, which shoot out almost at every joint, are terminated by purplish flowers, which are succeeded by small triangular seeds, black on the outside, and white within.

Buck-wheat will thrive in any soil, not excepting even barren sands, as they are commonly termed; but grows largest in dry ground which have been well ploughed. When raised for its grain, a bushel of seed is sufficient for an acre of land, which will frequently yield fifty or sixty bushels: but when it is intended for green fodder, which is the use most commonly made of it here, some people sow three or four bushels on an acre, in order to have a thick crop. The usual time of sowing it is about the beginning of May; but if it be sowed somewhat earlier, and a warm season ensues, it will bear cutting twice in the summer. It comes up soon, and ripens generally, according to M. du Hamel, in one hundred days after sowing, so that buck-wheat sown in June is reaped in September.

When mowed, it must be left in the field several days, that its stalk may dry before it is housed. There is little danger of the seeds falling out, nor is it much injured by wet. These seeds are excellent food for pigeons, poultry, hogs, rabbits, &c. and are found to make horses thrive when given among their oats: but for these they should be first cracked in a mill; being apt, otherwise, to pass through them whole. The flower of

buck-

buck-wheat is very white, and makes a good ſort of pancake, when mixed with a little wheat-flour. The poor in ſome countries make even bread of this mixture; but it is black, bitter, windy, and not nouriſhing. Its ſtraw, or haulm, is alſo given dry to cattle: but the beſt way is to feed it whilſt green, particularly juſt before it bloſſoms. Milch-cows fed with it will yield an extraordinary quantity of milk, remarkably good for making butter and cheeſe: and another advantage attending this paſture is, that it will continue green in the drieſt time of ſummer, when other graſſes are burnt up. It is an excellent dreſſing for land, where ploughed in without being mowed.

The ingenious author of the Eſſays in Huſbandry tells us, that in certain lands of Brabant, called Rempen, the huſbandman raiſes buck-wheat in ſmall fields near home, and places round them, under the hedges, a great number of bee-hives, from whence he draws conſiderable profit; for no plant affords theſe inſects a better ſupply of materials for making honey. *Eſſay* I. *pag.* 110. *Mortimer's Huſbandry*, *vol.* I. *pag.* 136. *Du Hamel's Elements of Agriculture*, *vol.* I. *pag.* 91. *Maiſon's Ruſtiques*, *tom.* I. *pag.* 624.

BUD, that part of the ſeed which firſt begins to ſprout, or rather the leaves which firſt appear.

Bud, alſo ſignifies the ſprout from whence the branch ariſes. Theſe buds in ſome meaſure reſemble ſeeds, as under a number of ſcaly coverings the rudiments of the young branch are ſeen: but neither the lobes nor the young root are met with; becauſe this tender ſtem is connected with a tree, which ſupplies it with the neceſſary food.

Bud is likewiſe uſed in ſome counties of England for a weaned calf of the firſt year; becauſe the horns are then in the bud.

BUDDING. *See the article* Inoculation.

BUGLE, *Middle Compound*, *Sicklewort*, or *Herb Carpenter*, the name of a low weed, with two kinds of ſtalks; round creeping ones, which ſtrike root at the joints; and upright ſquare ones, hairy on two of the oppoſite ſides, alternately, from joint to joint, bearing looſe ſpikes of blue labiated flowers, of which the upper lip is wanting: the leaves are ſomewhat oval, ſoft, ſlightly cut about the edges, and ſet in pairs at the joints. It is a perennial weed, infeſting moiſt meadows and paſture-grounds, and flowers in May.

BUGLOSS, or *Viper's Bugloſs*, the name of a plant whoſe ſtalks are rough, round, ſolid, erect, undivided, and marked with black ſpots: the leaves are very rough, long, narrowing to a point, and placed without any certain order. The flowers are large and ſpacious, of a beautiful blue colour, and grow in long bending ſpikes. They conſiſt of one petal, divided into five roundiſh ſegments, of different ſizes, and reſemble a horn in their figure, expanding by degrees, from a narrow beginning. The flower cup conſiſts of five narrow ſegments, and contains four rough ſeeds.

Bees are very fond of the viper's bugloſs, and there is reaſon to think that this plant, aſſiſted by the culture of a ſkilful gardener, may receive, perhaps, as many improvements as the auricula did. Its branches will riſe to the height of three feet, and no vegetable would better adorn flower-pots in large chimnies; for if the water be changed, it continues blowing near a fortnight after cutting. Its ultra-marine, blue-colour, is the fineſt that can be ſeen, and the ſtalks are garniſhed with flowers from top to bottom; dyers might, perhaps, extract an uſeful tincture from the roots. This plant grows wild in hard braſhy ſoils. *Eſſays in Huſbandry*. *Eſſay* I. *page* 110.

BUILDING. *See the article* Farm-houses.

BULB, or *Bulbous Root*, ſignifies a root of a roundiſh figure, and uſually furniſhed with fibres at its baſe.

Bulbous roots are ſaid to be ſolid, when compoſed of one uniform lump of matter; truncated, when compoſed of a multitude of coats ſurrounding each other; ſquamoſe, when compounded of, or covered with, leſſer flakes; duplicate, when there are only two to each plant; and congerate, when there is a congeries of ſuch roots to each plant.

BULL, the male of the ox kind. *See the article* Ox.

The bull, kept for propagating the ſpecies, ſhould have a quick countenance, his forehead broad and curled, his eyes black and large, his horns large, ſhort, and black, his neck fleſhy, his belly long and large, his hair ſmooth like velvet, his breaſt big, his back ſtrait and flat, his buttocks ſquare, his thighs round, his legs ſtrait, and his joints ſhort; this ſort of bull is the beſt for breed, and makes the beſt ox for draught. *Mortimer's Huſbandry*, *vol.* I. *page*. 226.

The bull chiefly ſerves for propagation; and though he may be ſubject to the yoke, yet there is no being certain of his working quietly, and the uſe he may make of his prodigious ſtrength, is conſtantly to be guarded againſt. This creature is naturally untractable, ſtubborn, and fierce; and in the bulling ſeaſon, abſolutely uncontroulable, and often furious; but, by caſtration, the ſource of theſe turbulent impulſes is deſtroyed, without the leaſt diminution of his ſtrength. He alſo grows larger, more heavy and unwieldly, and becomes more adapted to the labour for which he is deſigned. This operation alſo renders him more tractable, patient, docile, and leſs troubleſome to others. A herd of bulls could not be either tamed or managed by human ſkill. *Buffon's Hiſtoire Naturelle*, *tom.* IV.

BULLEN, hemp ſtalks ſtripped from the bark.

BULLIMONG, or *Bullimony*, a mixture of oats, peaſe, and vetches.

BULLS-FOOT, the ſame with colts-foot. *See* Colts-foot.

BULLWEED, *Great Knapweed*, or *Matfellon*, the name of a perennial weed common among corn: it riſes to about two feet high: the ſtalks are round, ſtreaked, and hoary: the bottom leaves are oblong and undivided, but thoſe which grow on the ſtalk are cut and divided. The flowers reſemble thoſe of the blue-bottle in ſhape, but are of a red colour. The ſeed is ſmall, oblong, reddiſh, and hairy in the upper part.

BUNS, the ſtalks of hemp after the bark is taken off.

BURN-BAKING, or *Burn-beating*, often called *Denſhiring*, or *Devonſhering*, from its being long practiſed in that country, a method of cutting up the turf, and after drying and burning it, the aſhes are ſpread over the ſurface by way of manure.

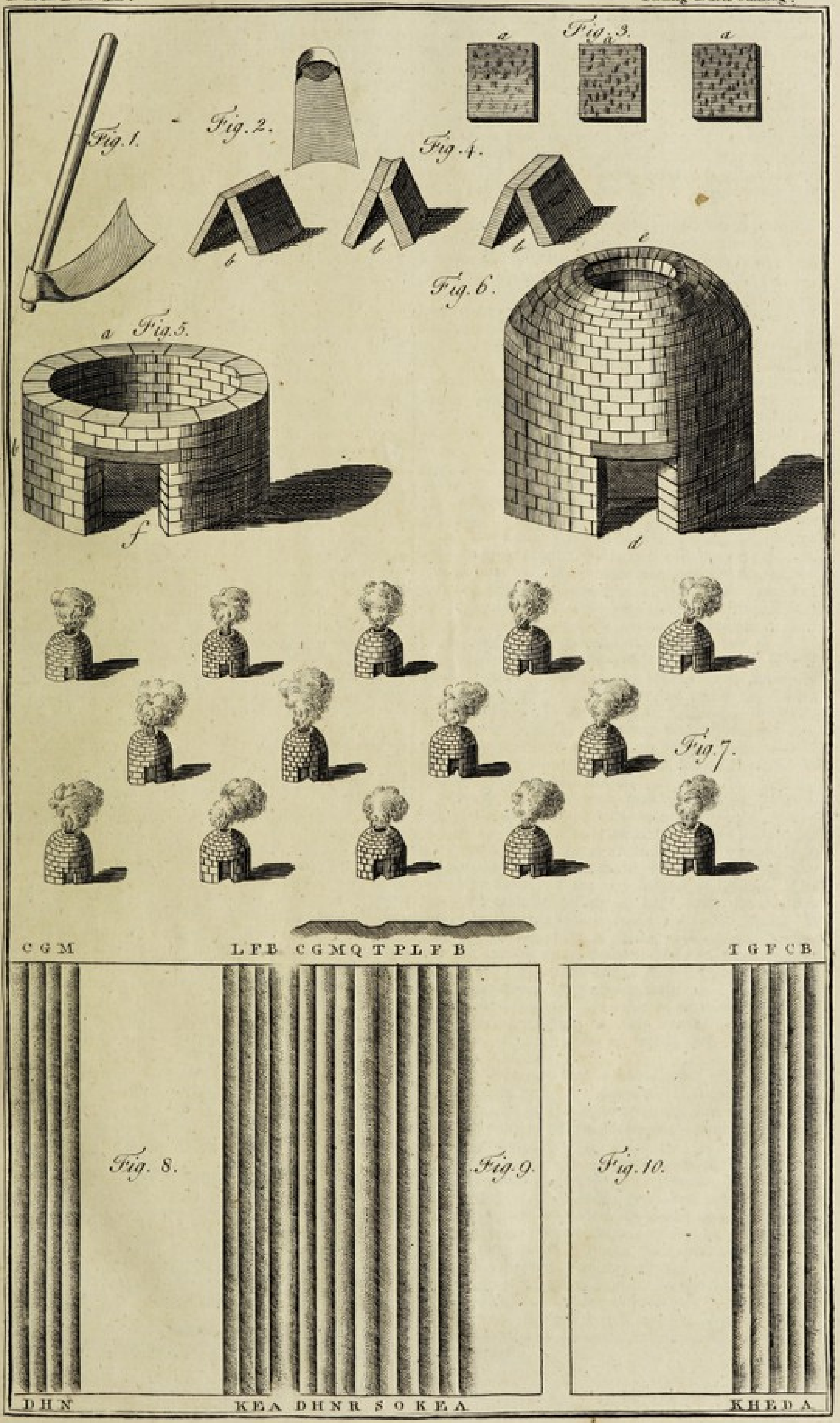
This method of improving land is very ancient, Virgil mentions it, and it has been practiſed time out of mind in Cornwal and Devonſhire. The marquis of Tourbilly has founded his famous treatiſe *Sur les Defrechemens*, publiſhed in 1761, principally on the art of burn-baking. We ſhall here give the ſubſtance of what the marquis has delivered on that intereſting ſubject.

When it is intended to break up any piece of waſte-ground, the nature of it ſhould be firſt conſidered, and may, in a great meaſure, be known from its natural produce, which is generally heath, ruſhes, fern, broom, furze, brambles, &c. intermixed with graſs: for, from the height, thickneſs, and vigour of this wild growth, a proper judgment may be formed with regard to the degree of the goodneſs of the ſoil, and what may reaſonably be expected from it.

When ſuch ground is to be broken up, it will be right to begin in the winter in order to get rid of the three principal obſtacles, namely, water, ſtones, and ſuch large roots as the paring mattock, or beating-axe, as it is called in the weſt of England, may not be ſtrong enough to cut. Afterwards, about the middle of March, the paring of this ground ſhould be begun, by a number of labourers proportioned to the extent of the land intended to be pared.

Every one of theſe labourers muſt be provided with a paring-mattock, or beating-axe, the form of which is repreſented on Plate II. Fig. 1. Towards the edge, where it is ſharpened like an addice, it ſhould be made of well tempered ſteel, and about nine inches wide. From thence the iron part, which ſhould be ſix inches in length, leſſens in breadth towards the handle, as in Fig. 2. where it is reduced to three inches. All the upper part muſt be made of the beſt iron, and ſhould be formed ſomewhat hollow, with a little bending inward. It ſhould be ſtrongeſt in the middle, and of a thickneſs

PLATE II. Facing Burn-baking.



thicknefs proportioned to its fize, as well as to the work, for which it is intended. The hole to receive the handle fhould be two inches in diameter, and the handle fhould be of wood, about three feet long, or a few inches more or lefs, according to the height of the man who ufes it. This inftrument, exclufive of the handle, fhould weigh from ten to twelve pounds, according to the ftrength of the labourer: a lefs weight would not be fufficient for the purpofe.

The ftouteft and moft intelligent labourer muft be then fingled out to lead the reft; for they cannot work in a row as when they dig. This leader ftanding in a proper pofture to manage his beating-axe, muft give two ftrokes with it, cutting into the foil, to the right, two more ftrokes to the left; and afterwards a fourth ftrait before him; by which means he will immediately raife a turf about a foot and a half long, a foot broad, and four inches thick of earth. This turf refting upon the axe as it was cut, is then, with one motion, to be placed on the labourer's right-hand, in its natural pofition, with the mould fide downwards. (See Plate II Fig. 3. where *a*, *a*, *a*, are three turfs as cut from the foil.) All the wild growth upon this land, will, if not very large, come off with the turfs thus cut; and the more there is of it, the better it will be. The turf muft abfolutely be cut with a depth of at leaft four inches of foil: for if the ground be pared to a lefs thicknefs, the work will be badly done; becaufe the beating-axe will not have gone under the netted roots of all the rubbifh growing on the furface, which it is indifpenfibly neceffary to deftroy: otherwife thefe roots will make frefh fhoots, injure the corn, and in time choak it entirely, as has happened to me in the beginning of my undertakings.

The workmen, efpecially if they undertake the work by the acre, would be glad to take this turf off as thin as poffible; becaufe that would fave them a great deal of time and labour. But I have experienced to my coft the imprudence of making fuch bargains. They muft therefore be well watched; for otherwife, befides the inconvenience of not effectually deftroying the wild growth, fuch thin turf would not yield a fufficient quantity of afhes for manuring the land. The bufinefs will indeed go on flower, but practice will foon render the workmen more expert.

Their leader having cut a turf, and placed it on his right-hand fide, muft then advance a fmall ftep, and take off another of the fame fize and thicknefs, which he muft alfo place on the fame fide, in a line with the former, on the further end of which the neareft end of this fhould reft, fo as to incline a little. He is then to proceed ftrait on, laying all the turfs in the fame manner. As foon as he has taken up the two firft turfs, the fecond labourer, ftanding on his left hand fide, is to take up his line of turfs in the fame manner, and place them on his right, in the void fpace cleared by the leader. As thefe advance, each of the other labourers, fucceffively one after the other, muft put himfelf on the left of the preceding, at the fame diftance, and do the fame work, following each other like reapers. Thus, if the firft began at B (Plate II. Fig. 10.) he lays his turfs along the line which terminates the plate; and when he has cut two turfs, the fecond begins at C, and lays his turfs in the fpace BA, cleared by the firft. The third follows the fecond in the fame manner, clearing the fpace FE, and laying his turfs in the fpace CD, cleared by the fecond. The fourth clears the fpace GH, and and the fifth JK, and fo on. The fame muft alfo be underftood of Fig. 8, and 9, which therefore require no further explanation.

When the labourers come to the end of the ground, which will likewife be in progreffive order, the leader muft return to the fide where he firft began, and refume his work clofe to the fpace already pared; the others are to follow in their regular turns, and repeat the fame operations as before; for this work muft always be performed in the fame direction, and not backward and forwards. Such fhould be the method till the whole ground is pared.

If, as it fometimes happens, there be reafon to apprehend that the fods will not dry faft enough when only laid a little flanting, with the end of one juft refting upon the extremity of another; they may in this cafe be piled, as faft as they are cut, in little heaps of three, four, or five together, according to their thicknefs, and the quantity of combuftible or vegetable matter contained in them. The air paffing between thefe fods, which are always laid with the heath or turfy fide uppermoft, penetrates and foon dries them, efpecially if the weather be fultry: but at the fame time it would be wrong to wait till they are quite dry, becaufe they would then burn too much, and too faft; in which cafe their afhes are neither fo good, nor in fo great quantity, as thofe of turf more flowly burnt. A juft medium, which practice will eafily teach, is to be obferved in this refpect.

Sometimes thefe turfs are fet upon their ends, two and two meeting at the top, and being further afunder at the bottom, like the roof of a houfe, with their heathy fides outwards, as reprefented at *b*, *b*, *b*, (Plate II. Fig. 4.) but this method, which lengthens the work, and therefore renders it more expenfive, is fitteft for the turfs of bogs or mafhes, when cut too wet.

With refpect to the roots, which I faid muft be got rid of before any land can be properly broken up, I meant only fuch large roots as the beating-axe cannot cut through, though fharpened with a whet-ftone from time to time, when its edge is either turned or blunted. For with regard to the roots of fmaller fize, fuch as thofe of the dwarf furze, the common heath and young fern, fmall holly, young plants of thorns and junipers, brambles, broom, and other wild productions, which have not attained too great ftrength, will, without much difficulty, be cut and pared off with the turf.

But the ftrong roots of fhrubs, bufhes, &c. which the beating-axe cannot fever, muft remain in the ground, though that will not hinder our taking off the turf between them to a proper thicknefs. The fods thus cut will indeed be often very irregular in length and breadth; but they are the better for burning, as they contain a greater proportion of vegetable matter.

It has been already obferved, that thefe turfs fhould be laid in little heaps as they are cut; thefe fhould be placed in the intermediate fpaces, where the ground has been pared between the roots yet remaining in the earth. Thefe roots fhould be grubbed up with a fpade, pickaxe, &c. without difordering the little piles of fods. It will be fufficient if this work be finifhed before the time of fowing. *See the article* GRUBBING.

Some grub up thefe roots before they burn the turf, and others after, as beft fuits their convenience: but in the latter cafe they fhould certainly be taken up in thofe places where the furnaces are to be made, becaufe it is of great importance not to ftir the heaps of afhes produced by them, till the very inftant of fowing. The holes alfo made by pulling up large roots, fhrubs, &c. fhould be filled up fo as to render the furface even. In countries where wood is fcarce, thefe roots, ftumps, &c. are carried away, and dried for fuel, efpecially for the kitchen; by which means they frequently repay at leaft the expence of grubbing them up. But in places where wood is of fo little value as to render thefe not worth the carrying off, the beft way is to burn them with the turf, the afhes of which they will both increafe and improve.

The thicker any land is covered with thefe wild productions, the better it will prove. If it cofts more than another parcel of ground to break up, and bring it into order, it will, in return, make ample amends, by producing greater crops.

When the feafon is not too wet, the turfs will generally dry fufficiently in about three weeks, even without being turned; but in rainy years they require a longer time, and muft be turned again and again, to prevent their ftriking out new roots and fhoots, which would hinder them from burning, as I have feen happen. Hence it appears, that this method of clearing and breaking up ground requires a longer time, and is attended with more labour and difficulty in rainy than in dry feafons. But as the turfs may be turned by women and children, the additional expence will not be very confiderable.

About Midſummer, or a few days before, when the turfs are ſufficiently dry, a number of women and children ſhould be employed, in fine clear weather, to gather them all up, ſome with iron forks, others with their hands, and pile them up from ſpace to ſpace, in round heaps about ten feet high, and of the ſame width at bottom, almoſt in the ſhape of charcoal furnaces. The heathy ſide of the turf muſt be placed downwards, and the earthy ſide upwards. A ſmall hollow ſhould be left in the inſide, in order to form a kind of chimney, the opening of which ſhould face the wind. *a b* (Plate II. Fig. 5.) repreſents a furnace of this kind partly built, where *f* is the door, or opening into the chimney of the furnace. Fig. 6. is a furnace completed, where *e* is the top of the chimney, and *d* the door. Fig. 7. repreſents a great number of theſe furnaces on fire.

It has been already obſerved, that this work muſt not be ſet about in rainy weather; becauſe if the heaps of turf ſhould unfortunately be ſo much wet as to imbibe the water, they would not burn, but muſt be pulled down and ſpread anew, to dry as before. They might alſo, in this caſe, require very frequent turnings, as has happened to me; which would retard the operation, and increaſe the expence: beſides which, it might not even be poſſible, by frequent turnings, to dry them ſufficiently before autumn, if the rains were frequent, which muſt occaſion a very conſiderable loſs.

However, this laſt accident, though poſſible, is very rare. It never befel me; and by enquiring of thoſe to whom it has happened, I found that it was, in a great meaſure, owing to their own negligence. The beſt method to avoid theſe inconveniencies is, to embrace the advantage of the firſt fine weather, and if it appears at all uncertain, to ſet more hands to work, without aiming at an ill-timed ſaving: for it is upon the due piling up and burning of the turfs, after being properly cut and dried, that the whole ſucceſs of this important branch of huſbandry chiefly depends. It cannot therefore be done too ſpeedily. When rain is apprehended, every other buſineſs ſhould be left for this, and all hands, men, women, and children, ſhould be inſtantly employed, to diſpatch it as ſoon as poſſible. Nothing requires greater diligence. The heaps ſhould be ſet on fire the moment they are finiſhed, or at leaſt, though the weather ſhould ſeem ſettled, before the huſbandman retires in the evening. Children may do this, by putting a little lighted ſtraw or heath, with an iron fork, into the chimnies of the furnaces. The dry heath, graſs, and roots, will catch inſtantly, and in a few moments the fire will become ſo violent, as ſcarcely to be approached. It may then be left, after taking proper precaution to prevent its extending further than it ought; eſpecially if it be near any wood, hedge, or heath, where it might otherwiſe do great miſchief.

The misfortunes occaſioned by fire have been ſo numerous and dreadful, that too much care cannot be taken to guard againſt them. If the ſituation of the land which is to be burned be ſuch as gives the leaſt room to fear any danger of this kind, the furnaces ſhould only be lighted in calm weather; leaſt the wind ſhould ſpread the flames to neighbouring grounds, where it might be impoſſible to ſtop them till they had done irreparable damage.

If it be ſurrounded on all ſides with woods, heath, or other vegetables eaſily ſet on fire, a row of furnaces ſhould, in this caſe, be made around the land to be burned, at the diſtance of twenty-five, or thirty feet from the neighbouring grounds, and at leaſt ten feet from the other furnaces, which are afterwards to be built farther within this incloſure. Care ſhould then be taken to obſerve from which ſide the wind comes, and fire ſhould be ſet to thoſe furnaces that are ſituated fartheſt from the wind, or neareſt to that ſide on which the wind blows. A number of men ſhould watch theſe furnaces while they burn, and ſhovel up earth upon them, if they are ſo full of heath or combuſtible matter as to occaſion too violent a flame.

The throwing on of this earth will deaden the flames, and concentrate the fire; by which means the furnaces will be conſumed by ſlow degrees, without hurting either the outward borders of the pared land, or its inner parts, where this fire might do miſchief two ways; firſt by ſpreading to, and burning the yet unpiled turfs, the aſhes of which would ſoon loſe their virtue, if ſcattered upon the ſoil in this looſe manner; and ſecondly, by catching the other furnaces, in caſe they ſhould be already made; by which means the fire would ſoon become ſo great, that it would be no longer poſſible to ſtop its progreſs, or prevent its extending to the neighbouring grounds.

When the firſt row of furnaces is thus conſumed, the next row may be burnt in the ſame manner, and ſo on till the whole is finiſhed.

The morning is doubtleſs the moſt proper time for lighting all theſe furnaces, becauſe the people employed in buſineſs have then the whole day before them, to watch the fire, and prevent accidents, which it might be very difficult to remedy in the night, particularly during the firſt violence of the flames. A number of proper perſons proportioned to the extent of the ground, ſhould remain upon the ſpot all night, as well to attend the burning of the turf, as to hinder wicked wretches from ſetting fire to other places, of which there have been too many inſtances.

By not neglecting any of theſe precautions, though all of them are not neceſſary where the fire cannot ſpread to adjacent grounds, every inconvenience may certainly be avoided.

If it ſhould be found neceſſary to light the furnaces in the evening, though as I have juſt obſerved, the morning is a much fitter time for it, they muſt be ſuffered to continue burning till the next day, when the violence of the fire will be abated. A few men, or even women and children, ſhould be then ſent in among the heaps, with iron forks, to give them a little ſtirring, and lay upon them the turf which may have fallen down. Theſe furnaces will ſtill continue burning for ſome days, during which the turfs will be ſlowly conſumed or calcined. If any of them ſhould be ſituated on wet ſpots, where they will not burn, theſe women and children muſt mend them, and add freſh fuel, ſuch as dry heath, ſtubble, or even a little dry wood, with ſome of the burning turfs from the adjacent furnaces. As ſoon as the fire is extinguiſhed in all the heaps, which will be then reduced to heaps of aſhes, finer or coarſer in proportion to the goodneſs of the ſoil, the women and children muſt ſhovel them up into little round heaps, leſt they ſhould loſe their fertilizing quality, if left in the manner they fell in the burning: for all our treaſure conſiſts in the ſalts contained in theſe little heaps, and the volatile parts of thoſe ſalts, which are much the beſt, would ſoon fly off, if expoſed to the air. The dews at night, and the firſt rain which falls upon thoſe heaps of aſhes, form on their ſurface a cruſt, which hinders their being blown away by the wind, renders them impenetrable to the action of the air, and keeps in all their virtue: the ſooner therefore rain falls after this operation, the better. Nor would it be any injury if it ſhould rain as ſoon as the furnaces are thoroughly lighted, unleſs it ſhould be very violent indeed, and of long continuance, which rarely happens at this ſeaſon.

When the aſhes are thus laid up in little heaps, nothing more remains to be done to this ground till the time of ſowing; care indeed muſt be taken, that neither men nor cattle approach them ſo as to break their cruſt. The land will from hence be freed from all ſeeds of weeds, and other wild productions, as well as from all worms, inſects, reptiles, and venomous creatures; the action of the fire of the furnaces being ſo ſtrong, that it heats not only the earth, beneath them, to the depth of ſeveral inches, but likewiſe all the intermediate ſoil.

A fortnight after the uſual ſeed-time of the country, for wheat and rye, will be early enough to ſow this burnt ground. When that is to be done, a number of women and children ſhould be ſent into the field, on a ſtill, calm day, with wooden ſhovels, to ſpread the aſhes equally over all the ground, excepting the ſpots where the furnaces were; for theſe are ſo thoroughly burnt, that they want no farther manure, and are always obſerved to produce the fineſt corn. Some of theſe women and children ſhould alſo carry iron forks, to break and ſpread ſuch turfs as may not have been thoroughly conſumed;

consumed; for these having been baked or calcined by the action of the fire, will be very beneficial to the land.

Immediately after the ashes are spread, the corn, whether wheat or rye, should be sown over those ashes by a skilful sower, in not more than about half the quantity generally used for a similar extent of other ground. The ploughman should follow the sower, with his team, either of horses or oxen, yoked to a strong plough, having two fins to the share. *See the article* PLOUGH. He should not, however, cut too deep this first year, but make only shallow furrows, going and returning, to cover the seed. Women and children, with hoes and iron forks, should then be employed to break carefully all the clods, together with every remaining bit of turf; and finally to close the tops of the ridges, which the plough cannot do with the necessary exactness in this ploughing. If several ploughs work at the same time, as is generally the case with many, the number of women and children must be increased in proportion, and there must be a sower before each plough.

It is very difficult to sow these lands with half the quantity of seed generally used in other places. The most dexterous are apt to mistake, and I have experienced the bad effects of employing only one sower for several ploughs. A man who goes before each of them will sow much more equally: nor need he even lose any of his time, because when he is not employed in sowing, he may help the women and children to break the clods. The ploughman should always proceed slowly and cautiously in this first tillage, especially if the ground seems never to have been ploughed before. If his plough should chance to be stopped by any stones or roots, which may have escaped the endeavours used to discover them by means of the borer (which should be always had recourse to as soon as the surface of the ground is cleared) the other men within call, or even the wo- and children, must immediately take them up with crows, and pick-axes, and carry them out of the field.

Care must also be taken not to spread the ashes out of the heaps over more ground than can be sown in the same day and the next morning, that they may not be unnecessarily exposed to the hazard of losing their efficacy: but if it should begin to rain, or the succeeding day be a Sunday, no more ashes should be spread than can be sowed and ploughed immediately. These two circumstances excepted, it would be right to spread over night what is to be ploughed in next morning; for I have experienced, that the little nipping frosts in this advanced season, will often be strong enough to freeze the ashes and bits of turf not thoroughly consumed, so as to render them unfit for spreading, till the sun has thawed them; by which means a morning's work might, without this precaution, be lost.

When the seed is sown and covered, drains should be cut with the same plough, either directly across the furrows, or in an oblique direction to them, according as the declivity of the ground may require, in such manner that they may empty themselves into the main surrounding ditches, to carry off the water, especially in the winter. Some of the men employed in breaking the clods will easily deepen these drains, to whatever degree you may think proper, with an instrument shaped like a hoe, with a strong flat iron spike, about fifteen or sixteen inches long, on each side of it. This instrument is very useful, and even necessary, upon several occasions; nor is there any better for stirring the ground. It will likewise serve to complete the breaking up of such parts of the spots where the furnaces stood, as may not have been sufficiently cut by the plough; and to finish the imperfect ends of the furrows, next the head-lands, where the plough could not reach, and where the grain would be otherwise exposed to the air and birds.

Though the spirit and warmth of the salts contained in the ashes, will soon render this corn more forward than any other; yet as there will not be among it either grass weeds, or wild productions of any kind, the seeds of all these having been destroyed by the action of the fire, it will appear thin during part of the winter: but on the approach of spring, it will shoot up, spread, and tiller, so as often to become too thick at last. It always ripens about a fortnight sooner than any other corn in the country; and the finest, as already observed, is constantly found on the spots where the furnaces were erected; the effect of the fire having been greater, and penetrated deeper in those than in any other places.

As all our riches, as before observed, consist in the ashes, the more there is of them, the more the ground thus broken up will be fertilized. But all kinds of soil do not afford an equal quantity of ashes when burnt; for though the burning be performed with ever so much care, repeated experience for some time past, has taught me, that only some of the earth and stones, according to their quality, are reduced into lime, or calcined, by the operation of the fire, and that other parts of them will run into glass. The soils that calcine most are undoubtedly best, and yield the largest produce of ashes; while those, on the contrary, which burn to a glassy substance, are the worst, and give the fewest ashes. Of this kind is sand; and indeed, we may judge with certainty of any soil intended to be improved by burn-baking, by previously making trials on different parts of it. If the owner cannot go thither himself, he may order some of the turfs, cut with a depth of four or five inches of earth, to be brought to him, in order to their being dried and burnt. He may also have, in the same manner, in bags of paper, properly numbered, samples of the soil, or of the stones underneath, at every six inches from the surface, to the depth of eight or ten feet. These samples may be easily procured by means of the borer, already described under that article.

If the person who makes these trials be not provided with a borer, holes may be dug. They will not cost much, and he will be thereby enabled to judge what grain, trees, or other productions, each soil is best adapted to. I have often practised this method with success, for improvements which lay at such a distance that I could not immediately inspect them myself: but as the judging of lands in this manner, without actually inspecting them, requires great attention and long practice, the surest method therefore is to examine them on the spot, and there make the necessary experiments. The furnaces which are the most burnt, or those which burn the fastest, are not the best; for the ashes are there too much calcined, and their quantity reduced.

I have often seen much finer corn grow in places where the uppermost turfs of the heaps, which had burnt slowly, were only calcined, and remained so nearly entire, that it was necessary to break them before the ground could be sowed, than in those place where the furnaces, after being entirely burnt, were totally converted into ashes. In general, those heaps which produce white ashes, after they are burnt, are the least valuable, and commonly yield the smallest quantity. This denotes a greater degree of vitrification than of calcination. In proportion as the ashes are yellowish, brown, or blackish, which last indicates the greatest perfection, they are better in quality, and generally more in quantity. According as these different colours appear, the calcination exceeds the vitrification. I have dwelt the longer upon these different operations of the fire in the burning of land, because they are of great importance to those who break up ground in this manner, and no writers have hitherto given a sufficiently distinct account of them, for want of having had the necessary experience.

I must farther observe, that no land ought to be pared again too soon after it has been burnt; because its turf being destitute of a proper covering, would not take fire well, as I have experienced. It will be necessary to wait till the heath or broom has shot up sufficiently, which seldom happens in less than about two years. The dangerous practice of some country people, who frequently set fire to their heaths in the spring, under pretence of bringing up grass for cattle, is so contrary to the right method of improving land, by burn-baking, that it always retards, and sometimes absolutely prevents the executing of this far more beneficial method; especially if those burnings have been too often repeated.

In countries where it is not the custom to plough in ridges, but either in broad lands, or quite flat, in order to sow afterwards with the harrow, I think it would, however,

however, be right, to sow the ground thus broken up, at least the first year, under furrow, with the two-finned plough already mentioned; after which the usual method of the country may be followed, if it be found the most proper. I advise this as the best practice, and am satisfied that none will have cause to repent the trial. It will save the greater part of the expence of ploughing; and the ashes being less exposed to the action of the air, will the more strongly retain their fertilizing power. But, if, notwithstanding these reasons, the common practice of the country should be still preferred, even in the first year, the husbandman, in this case, should begin to spread his ashes in the manner before directed, about Midsummer; as soon as the furnaces are cooled, without leaving any in the places where those furnaces stood. Immediately after, a slight ploughing, just sufficient to bury the ashes, should be given, with the precautions before-mentioned with regard to the furrows. No more ashes should be spread at any one time, than the plough can cover in the same day. A few days after this first slight ploughing, a second should be given, somewhat deeper, in the same direction; and these ploughings should be continued, each going a little deeper than the former, till the ground be loosened to a sufficient depth. Two good cross ploughings will then be of excellent service: after which a fifth ploughing a-cross them, will bring them up to the direction they were in at first. The ground should be harrowed several times between all these ploughings, with harrows heavy in proportion to the strength of the soil; and if any hard clods have resisted the force of the harrow, women and children should be employed to break them, it being necessary to pulverize the soil as much as possible. I say as much as possible, because that cannot be perfectly compleated this first year. Perhaps the spiky roller would be of excellent service here.

The same women and children will also clear away all the stones, if there be occasion. As each successive ploughing will turn the stones upon the surface; but such only as are bigger than a man's fist need be removed. If any of the stones should be too large for the women and children to remove, the carters must take them up as they pass by; and if there should chance to be any under ground so large that the men cannot move or load them, they must be broke with sledge-hammers, and other iron tools proper for this work: or, if they are great rocks, they must be blown up with gun-powder; for nothing should stop the progress of this undertaking.

The time to sow the land thus broken up for the first time, will always be a fortnight later than the common time of sowing other lands in the same country, with the same kind of grain. A few days before this is sowed, it should have another light ploughing; after which it should be sowed, in proper weather, with half the usual quantity of seed, whether wheat or rye, and this seed should be covered, in either with the plough, or with the harrow. Drains should also be cut in this land, in the manner directed under that article, as soon as possible, to carry off the water in the winter. If any very large clods are left on the ground, women and children should be employed to break them. This land being thus sowed, nothing more need be done to it till harvest.

The quality of the land must determine what sort of grain will be most proper for the first year's sowing in this husbandry. If the soil be rich, it will bear wheat; if of a middling quality, it will produce meslin, or a mixture of rye and wheat, consisting of a greater or lesser proportion of either, according to the nature of the ground; and if it inclines to poorness, it will produce rye. These particulars may be judged of immediately after the burning. In general, unless the soil be very excellent, I would always advise the sowing of rye the first year. There will be a certainty of success with that grain; and the husbandman will be enabled by its produce, and by the ploughings, to judge what his land will be capable of doing the next year, without running any hazard. This has been my method. I have also experienced, that rye does much better than wheat in all light sandy soils thus broken up. When they are afterwards enriched to a certain degree, they become fit to bear meslin, and then wheat: though if they should never produce any thing but rye, the difference would not be great in point of profit.

As soon as the ground is cleared, a light ploughing should be given it, to bury the stubble; and some days after it should have a second ploughing somewhat deeper, but in the same direction. When this is done, two good cross-ploughings should cut the soil to the proper depth for sowing; and a fifth ploughing, afterwards to be given, will leave the furrows in their first direction. Between these five ploughings, which are to be performed with the plough having only one fin to the share, the ground should be well harrowed several times, and the stones and roots picked out. All these ploughings and harrowings will pulverize the earth, and mix it equally with the ashes. If this land is to remain in ridges, the above will be sufficient till the sixth ploughing, which should be given it a few days before the sowing, and should be followed by the last, performed with the two-finned plough to bury the seed: but if it be to be sowed in broad lands, or quite flat, the former directions in that respect are to be observed here. In whatever manner any of these new grounds, broken up with the plough, are sown, they will not require near so many hands to break the clods this second year, as were necessary in the first. With regard to the quantity of seed, a little more may be sown now, that is, about a third part less than is commonly used in the country, of the same kind of grain, for an equal extent of land.

The lands thus brought into tillage by means of burning, become infinitely better than other grounds, and produce much greater crops. This process improves the soil for upwards of twenty years. No weeds will spring up among the corn for a considerable time; for there are scarcely any, even now, in the lands I first broke up. The vegetable food in the earth is not therefore wasted here upon useless plants, but serves intirely to nourish the corn, which accordingly shoots with redoubled vigour, produces well-filled ears, without the trouble and expence of weeding it; and, when threshed, is so clean, that it needs only to be winnowed. The bread made of it is excellent, and of a superior quality. When in process of time these burnt-lands shall produce as many weeds as other ploughed grounds, they will then be in the same degree of imperfection; but it will be a long while before that happens; even longer than I can say; for I have not yet seen an instance of it. The remedy, however, is always sure and ready, namely, to let them rest two or three years, by which time they will have acquired a new sward, thick enough to be pared off, and burnt as before. This will restore them to their former perfection, without being near so expensive as the first paring and burning: for there will be no roots to grub up here, nor any stones to carry off; nor will it be so difficult to break the now much fewer clods. I have managed in this manner with great success, where there has been a sufficient depth of mould, lands which had formerly been in tillage, and would no longer produce corn because they were exhausted, either by two many successive crops, or too great quantities of weeds. They are now as good as any other burned land.

Worn-out meadows, which I have restored by the same means, and formed a-new with grass-seeds, have yielded great quantities of excellent hay. I have collected plenty of this seed during some of the preceding years, from meadows which were not too wet. Several of my neighbours have practised the same method with equal success: and, in a word, it is the most powerful restorative for worn-out land.

From what has been said, it evidently follows, that the paring and burning of the surface of the earth, is, indisputably, the best and surest way, either to clear, or restore the soil. It is making a most advantageous acquisition to one's own estate, the value of which is at least doubled, and oftentimes quadrupled by this means. To enrich one's self, without doing it at the expence of any person whatever, and, at the same time, to enrich the state, is surely an action worthy of a true patriot, and of a respectable father of a family. This may be done by following the method here laid down; a method which has been long known, though very superficially. I will venture to say, that it never was carried to the degree of perfection to which my practice has brought it; doubtless because none applied themselves particularly to it. *Memoire sur les Defrichemens.*

A correspondent of the editors of the *Museum Rusticum* has given us the following method of performing this operation in the fens of Bedfordshire.

About

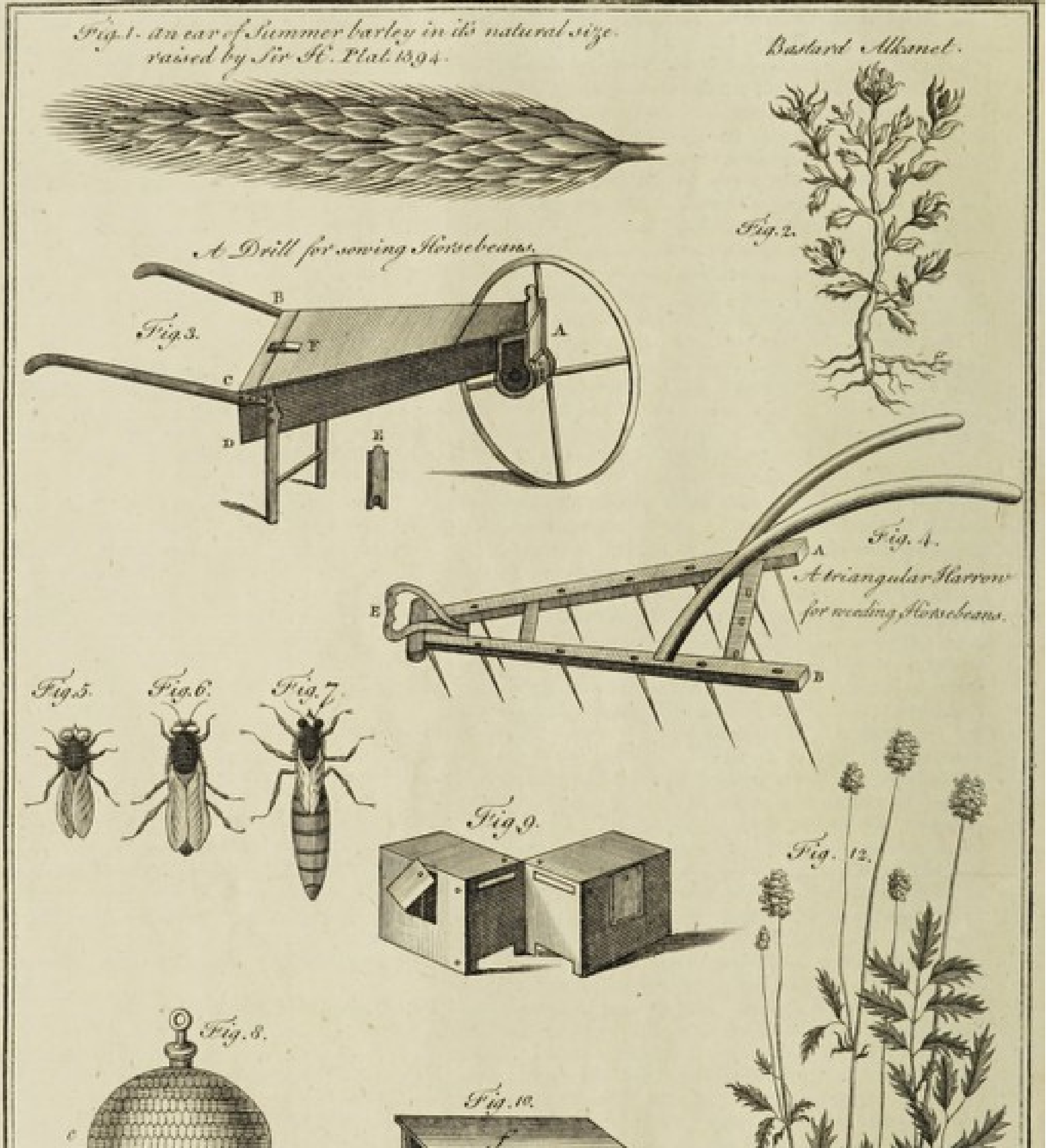


Fig. 1. An ear of Summer barley in its natural size raised by Sir H. Plat 1594.
Bastard Alkanet.
Fig. 2.
A Drill for sowing Horsebeans.
Fig. 3.
A
B
C
D
E
F
Fig. 4.
A triangular Harrow for weeding Horsebeans.
A
B
E
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 9.
Fig. 12.
Fig. 8.
c
b
a
d
e
f
Fig. 10.
f
b
a
a
Fig. 11.
f
d
d
d
d
a
a
Fig. 11.
Rocque's Burnet.
Bent Grass.
J. Hulett sculp.

About the middle of May, says this gentleman, we plough the land for burning, which is sward-land, that has not been ploughed for four or five years, or perhaps a longer time: our ploughs are what are called Dutch ploughs, with a large share; the edge and point are very thin and sharp, and are kept so by filing: the furrows should not be more than seven or eight inches wide, and an inch and a half thick, having as few baulks as possible. When it has lain so long that the sods or furrows are dry (in which the farmer's own discretion must guide him, it being impossible to point that out by words) it must be made into heaps about the size of middling grass-cocks, each person carrying on before him as heaps about seven furrows: the work will then direct him how big the heaps should be; they should be made as narrow at top as conveniently they can, by way of prevention against wet weather. If every person keeps his work as to the number of furrows, the heaps will rise in regular rows; but it should be observed to keep these rows in quincunx order (as represented on Plate II. Fig. 7.) that when you come to spread the ashes, they may cover the ground regularly.

When it is fit for heaping, the customary way of this country is to let the burning out to people, to burn and spread the ashes, which must be spread so as to cover the ground all over: the usual price is from four to five shillings per acre; but that, in a great measure, depends upon the dryness or wetness of the season. It would, however, I think, be most adviseable, where hands are plenty, to do this work by the day, as you may then employ as many persons as you think fit; for it should be burnt off with all possible expedition, because if it be long in burning, it is attended with bad consequence, which in rainy weather is hard to prevent: it is therefore very requisite to pursue the work briskly, otherwise the grass-roots, which lie below the reach of the plough, when ploughed for burning, will shoot out, and become almost as full of grass, as though it had not been ploughed at all: then, when you plough it after the burning, instead of breaking so that the seed may fall into the cracks, it will burn up as strait as clay, and then no seed can grow any where but in the seams between each furrow.

When one side of the field is cleared, and the ashes spread, you must, as soon as there is room, get to ploughing and sowing the seed. Nor must the furrows now be wider than those already mentioned, and about two inches deep; for as fen-land in general ploughs tough, rather than breaks, you will have more seams than if the furrows were made wider: the custom with us is to sow the seed as soon as possible after the land is ploughed. *Museum Rusticum, vol. i. p.* 420.

BURNET, the English name of a plant, now greatly cultivated as a green food for cattle in the winter. We have given a figure of this plant taken from a specimen gathered in a field belonging to Mr. Rocque at Walham-green, on Plate III. Fig. 12.

It is very natural to think that we have in England many sorts of grasses, which are well adapted to the climate, are wholesome food for cattle, and, with the assistance of proper culture, would produce very advantageous crops both to the grazier and farmer. We have, for many years, been sensible of the great advantages that result from the culture of saintfoin: in some soils lucern has been sown with considerable profit, and the Dutch trefoil is known to be excellent, when properly managed: but these only serve for green fodder in summer: they may, indeed, be dried, and made into hay, and in that form be reserved for the cattle's food in winter; but this, independent of the inconvenience, trouble, and uncertainty, that attend the making and keeping it in proper order, is not sufficient; the farmer has also occasion for green fodder in the winter, and early in the spring, and that on many accounts, particularly for feeding such of his ewes as will yean early in the year, as well as keeping them from losing their flesh after they have dropped their lambs.

A plant therefore which will not only live through the winter, but will also, if possible, vegetate in that season, cannot fail of being highly advantageous, provided it be at the same time a pleasing and nourishing food for cattle. All these properties have been lately found in burnet; it not only preserves its verdure during the hardest frosts of our winters, but also increases in bulk, and grows, if the weather be at all open and mild; and is now known to be an excellent food for cattle. This discovery is owing to Mr. Rocque, of Walham-green, who, at the request of the late Mr. Wyche, spent some years in endeavouring to find a plant that would prove an useful and succulent food for cattle during the winter; and, at last, fortunately discovered that burnet would answer the intention.

Mr. Rocque has also found by experience, that it will grow in the driest land: for he has planted some of it even in the gravel walks in his garden, where every thing else is burnt up in the summer, but this never withers; one of the qualities of burnet being to continue in sap all the year. It is the opinion of many, who have seen the burnet of his raising, that if this plant is generally cultivated, there will never be a scarcity of hay in England, even in the greatest drought.

The land, on which it is sown, should be fine, because it is apt to shed, and it should afterwards be dried perfectly.

Burnet does not lose its leaves in drying; and though the hay made of it be sticky, it will, after threshing, be very agreeable to horses, which are so fond of it, that they never waste any. One acre will produce upwards of three loads of hay, and above forty bushels of seeds. Horses are fonder of this seed, than they are of oats: and Mr. Rocque is of opinion, that it is a more proper food for those who do not labour hard, because it is not of so hot a nature. Burnet bears seed twice a year, and will afterwards yield a good spring crop.

It is not only good for horses, but also for all manner of cattle; even for swine: and Mr. Rocque has experienced another virtue in it, which is, that, being stung by a wasp, the leaves of this plant rubbed pretty hard upon the part so injured, immediately took off the inflammation.

If the burnet does not grow equally every where, some plants must be drawn where they are too thick, and planted where they are thinnest: or the vacant spaces may be supplied from the nursery. If the land was not got in good order to sow the seeds at a proper season, the burnet may be transplanted at Michaelmas from this nursery, and set at nine or twelve inches distance every way, according to the richness of the soil.

The seed sown in May may be mowed at the latter end of July. That sown in June will yield a pretty good crop, and must be cut but once; and the same of that which is sown in July. The plants produced by seeds sown in August should be mowed, to destroy the weeds. These mowings may either be given green to horses, or made into hay. The first spring cutting will purge horses; and Mr. Rocque believes it will also cure the grease: but it is only the first crop that purges.

Burnet should be mowed but once the first year, in order to leave it rank in the winter; and in this case it will be ready to feed in February or March, or to mow again in April.

If natural grass grows among the burnet, it may be harrowed in the same manner as lucern; for having a tap-root, the harrow will not hurt it: but it must not be ploughed, lest the roots should be broken in the ground.

When the seeds of this plant are to be saved, it must neither be fed, nor mowed, in the spring. The seed will be ripe about the middle of June, when it must be reaped like wheat, and threshed on a cloth. It should be threshed before it is too dry, because it is apt to shed, and it should afterwards be perfectly dried.

As a great deal has been written on the subject of burnet, we shall endeavour to set the whole in a fair light, by adding two letters which have been sent from gentlemen of known character and reputation, to Dr. Templeman, secretary to the Society of Arts, Manufactures, and Commerce. The first is from Davies Lambe, Esq; and was sent in consequence of a letter sent that gentleman by a member of the society, requesting his opinion with regard to the usefulness of burnet.

"My burnet, says Mr. Lambe, though very green and beautiful all the winter, made no great progress till the middle of April following, when I thought it absolutely necessary to feed it. I did so, but I did it too late, and kept my cattle upon it too long, from the middle of April to the 20th of May. This was a very great mistake; the burnet plants were now headed for seed, and the stock chiefly fed upon the heads, which greatly lessened my quantity of seed, as well as retarded the growth of the plants. I turned into the field, ewes, lambs, and calves, and they all fed very greedily upon the burnet. From what I had heard of M. Rocque, I very much expected them to scour, but there was not the least appearance of it, and the cattle throve accordingly.

The 6th of July I began to mow, the weather being favourable; six men and four boys threshed and cleaned the seed in seven days. I had 200 bushels of very fine clean seed, as many sacks of chaff, and seven loads of hay, from a field of seven acres and a quarter.

Satisfied that 200 bushels of seed would be more than I should be able to dispose of, I was not anxious after another crop, being rather desirous of seeing what it would perform as a pasture. Accordingly, in about ten or twelve days after the field was cleared, I turned into it seven cows, two calves, and two horses; they all throve very remarkably, and the cows gave more, and we thought a richer milk than in any other pasture; I really expected, (as burnet is so strong an aromatic) that the milk would have had a particular taste; but far otherwise: the milk, cream, and butter, were as fine, if not finer tasted, than any from the best meadows. I am satisfied, that there is no better pasture for cows, whether milch or barren, than burnet. The weather was now extremely droughty, all our pastures were burnt up, yet the burnet flourished, and grew away, as if it had a shower every week. My stock of cows, horses, and calves before-mentioned, pastured in it almost continually, till Michaelmas; by the middle of November it was grown so considerably, that I have again turned in six head of cattle, and if the weather is not severe, I am of opinion, it will maintain them till Christmas.

The burnet-straw, or haum, is, after the seed is separated from it, a very useful fodder for horses, cows, calves, and sheep; the chaff is of good value, if mixed with any other, however ordinary, chaff. I have fed all the above-mentioned stock with it promiscuously together in one field; putting the haum into racks, and the chaff into troughs, and if the haum was chopped with an engine, it would still be of much more value.

Burnet, I am fully persuaded, will prove a very great acquisition to husbandry on many accounts, but more particularly for the following reasons:

Burnet is a good winter pasture, consequently it will be of great service to the farmer as a constant crop he may depend upon, and that without any expence for seed or tillage, after the first sowing; whereas turneps are precarious and expensive, and when they fail, as particularly this year, the farmer is very often put to great inconveniencies to keep his stock.

It affords both corn and hay too. Burnet-seed is said to be as good as oats for horses. I know they will eat it very well; judge then the value of an acre of land, which gives you at two mowings ten quarters of corn and three loads of hay.

The seed indeed is too valuable to be put to that use at present; though it multiplies so fast, that I doubt not but in a few years the horses will be fed with it.

It will bear pasturing with sheep.

It makes good butter.

It never blows or hoves cattle.

It will flourish upon poor light sandy, stoney, shaltery, or chaulky land.

Burnet, after the first year, will weed itself, and be kept clean at little or no expence.

The cultivation of burnet is neither hazardous nor expensive: if the land is prepared as is generally done for a crop of turneps, there is no danger of any miscarriage; and any person may be supplied with the best seed at sixpence per pound, by Mr. Charles Thorp, seedsman, in the White-Hart-Inn-yard, Borough.

I make no doubt but that burnet might be sown late in the spring, with oats or barley. A gentleman in my neighbourhood did so last summer, and it succeeded very well. I should think a buck-wheat season, which is sown the last of all corn, would suit it very well; but of this I have no experience, and could wish to have the experiment tried. A pea-field, drilled in rows, and kept clean, would make an excellent season for burnet, as the pea crop would come off soon enough to prepare the land with two ploughings by the middle of August, after which time I should not chuse to sow it.

It very frequently happens, that every farmer who sows many acres with turneps, has several worth little or nothing; the fly, the dolphin, the black caterpillar, the dry weather, or some unknown cause, often defeating the industry and expence of the most skilful farmer. When this happens, as it too often does, I would by all means advise him to sow it with burnet, and in March and April following, he will have a fine pasture for his sheep and lambs.

Burnet is a native of England, and will certainly perfect its seed twice in one summer; and a farmer, with a small plantation, may supply himself with seed of his own growth at very little or no expence: he may then be encouraged to make experiments on various seasons, without much loss or damage.

Thus, Sir, I have sent you a true account of the success of my burnet, and also my opinion of it. I wish what I have said may any ways contribute to dispel the prejudice, or inform the ignorance of my countrymen."

The other letter is from Christopher Baldwin, Esq; of Battersea, a gentleman well known, and justly respected for his candor and fidelity.

"In the years 1763 and 1764, says Mr. Baldwin, I made several experiments on burnet, with a view to make myself acquainted with its manner of vegetating, and the uses to which it might be applied: and having by this means acquired that knowledge I was desirous of attaining, I determined last year to lay down several acres with burnet; nor would I content myself with doing it in any one particular method: therefore in the beginning of July, 1764, I sowed about eight rod of ground with five pounds of Rocque's burnet seed. Rain falling soon after the seed was sown, the plants came up very finely, and throve in such a manner, that I was tempted to plough up about an acre of ground and plant it that autumn, in order to see what effect the winter would have on the young plants. Accordingly on the fourth of October I planted them in rows, about twenty inches apart, and about fifteen inches from each other in the rows. This distance, from experiments and observations which I have made, seems to me a very proper distance. These plants took very well, and through the winter throve with surprising vigour. Last spring I ploughed the remainder of the field, being three acres, and planted it in the same manner with my plants, the whole of which, notwithstanding the uncommon drought of last summer, grew well, and the verdure of the plants was really very beautiful. No water was used; indeed it would have been a vast work in a field of that size: however, I never saw any need of it. The plants were once hoed, and stood over for seed, of which the quantity collected was not very great; but this must be attributed to the uncommon drought, for I think we had not above one shower of rain from the planting to the gathering of the seed, the whole of which amounted to about 160 pounds.

The seed being got, I was impatient to see how the cattle would take to it, as it was roundly asserted by some gentlemen, that no cattle would eat it. Accordingly I ordered four cows and two horses to be turned into the field; the cows fed freely upon it, but the horses did not seem to like it so much at first, though in two or three days they fed well upon it. Burnet has strongly the taste of cucumbers, and I was fearful it might give a disagreeable taste to the milk; it therefore gave me great pleasure to find, in about four or five days, that the quantity of milk was not only much increased, but the flavour of the cream much superior to any I had ever had before, or ever tasted from cows fed upon the richest meadows. The cows and horses having fed down the field, it was hoed again, and then harrowed once over, which laid it very clean, nor could I find that the burnet was at all hurt by the harrow.

Here let me observe to you, that I fed my horses in the stables for about five weeks with the burnet straw, or rather haum, from which the seed had been threshed. These horses fed very freely, and throve much upon it, though

though they had only half their uſual allowance of oats. However, as I would by no means ſecrete any circumſtance that may appear unfavourable to burnet, ſo I muſt tell you that I obſerved, when any friend called upon me, and their horſes were put into the ſtable, that ſome horſes eat very greedily of it, and others would not touch it. I cannot ſay this gave me much concern. I ſatisfied myſelf with thinking, that ſome horſes did not know what was good for them; or to ſpeak more ſeriouſly, I thought the novelty of the food might as much diſpleaſe one horſe, as it pleaſed another; and doctor Templeman knows, that there are ſome things which we loath as children, that we are fond of as men; and that there are ſome things which we as much diſlike as men that are very wholeſome food: but to come nearer to the point. It is well known ſome ſheep and cows will not touch a turnep, yet is any one weak enough to infer from thence, that turneps are an unwholeſome or an improper food for cattle? And I was lately told by a particular friend, that he had often obſerved, when his horſes had fed for ſome time on the ſaintfoin hay, that it was ſome days before they would again take to meadow hay. I ſhould not have mentioned this circumſtance of the horſes, but to ſhew my impartiality; and I do it the more readily, as I find there are ſome gentlemen who are as fond of decrying, as others can be of promoting, uſeful experiments in agriculture.

Being well pleaſed with the ſucceſs that had attended my firſt experiments in the field, which I call four acres, I determined to proceed as I had intended in the ſpring of the year; accordingly as ſoon as the oats were got off a field of twelve acres, I ordered it to be ploughed and ſown with the 160 pounds of burnet ſeed before mentioned. This field was ſown on the twenty-ſixth of Auguſt laſt; and no rain falling till the eighteenth of September, the plants did not appear till the twenty-eighth of that month: however, there ſeems to be a good crop, and I intend as ſoon as they freſh up in the ſpring, to have the plants ſet out with ſmall hoes (ſuch as are uſed for carrots and onions) to about ſix inches apart. And in about a week after this is done, I ſhall harrow it with light harrows; for from experiments which I have made, this ſeems to me to be the beſt method of managing broad-caſt burnet. Having nothing farther to ſay in regard to theſe twelve acres, I muſt return to the four acre field tranſplanted, which having been hoed and harrowed as before-mentioned, was laid up for winter feed for my cows; but finding lately ſome gentlemen had again aſſerted, that ſheep in particular would ſooner feed on the quick-hedges than touch the burnet, I ſent to a neighbouring farmer for his flock of ſheep, and having a friend with me, we followed the ſheep into the field, who fell upon the burnet ſo greedily, that we found it very neceſſary to ſend them home again.

Being much vexed at theſe idle tales told about ſo much to the prejudice of this (as it appears to me) excellent plant, I determined to put it to as fair a trial as I poſſibly could. Accordingly, I ordered in four cows, which were in very good feed on natural graſs, and had beſides a large truſs of oat-ſtraw put in their cribs every night, notwithſtanding which they gave very little milk, and indeed were almoſt dry. Theſe cows, I declare, had not been in the burnet above ſix days, before they gave much more than double the quantity of milk; nay, was I to ſay three times the quantity, I know I ſhould not exceed the truth. The milk is exceeding fine, and free from all bad taſte; and further I muſt obſerve, that they ſoon began to leave half their ſtraw in their cribs; ſo that they are now ſerved with only half the quantity they had before. My land is a poor dry upland gravel; there are millions of acres in this kingdom of better land that do not fetch two ſhillings and ſixpence an acre. What a field therefore is here for improvement! Nay, I cannot but obſerve with amazement, the great numbers of country gentlemen who daily flock to this great city in purſuit of trifles, when they have ſuch inexhauſtible funds of knowledge within themſelves, if they would properly make uſe of them; confident I am, I could point out methods of improvement that would ſurpriſingly better their eſtates.

As the account I have now given you of burnet may appear a little extraordinary to ſome of the worthy members of your ſociety, ſo I ſhall be far from being diſpleaſed at their even doubting what I have now ſaid: on the contrary, it will give me pleaſure, provided any gentlemen, who have ſuch doubts, will do me the favour to call at my houſe, and convince himſelf by ocular demonſtration of what I have now ſaid."

BURNING *of heath*, a common practice of the country people for clearing heathy ground, in order to procure graſs and herbage for their cattle.

The fitteſt time for burning commons is towards the latter end of ſummer, when the plants are withered. But great care muſt be taken that the fire extends no farther than is intended.

This care conſiſts chiefly in clearing away all the graſs, &c. on the ſide you would preſerve from the flames, to a diſtance ſufficient to prevent all communication. The graſs, &c. cut down there ſhould be ſpread upon the part intended to be burnt, which will ſerve to kindle the fire after it is dry.

Beſides this precaution, a fair, calm day muſt be choſen; when by kindling the fire on the ſide the wind blows from, you prevent its ſpreading any further that way, and ſee it gradually remove up into the heath or common. The fire ſhould be carefully watched for fear of accidents. But, if notwithſtanding theſe precautions, it ſhould ſpread to places intended to be preſerved, and no water ſhould be at hand, the moſt effectual way of ſtopping the progreſs of the fire, is to dig a trench: for by throwing up the earth on the ſide where the fire is, you cover the graſs, and thereby hinder the flames from extending any further.

BURNING *of land*. *See the articles* BURN-BAKING.

BURNS, are accidents that often happen to animal bodies, whereby a ſolution of the continuity of the parts are produced.

In burns and ſcalds, when the ſkin remains entire, let the part be bathed well, and kept wrapped up in rags dipped in ſpirit of wine camphorated. Salt bound thick on the part has alſo been found very effectual for this purpoſe. Indeed all ſaline and ſpirituous applications excel all others, while the ſkin is yet unbroke; but when the ſkin is ſeparated, anoint the part, and keep it conſtantly ſupple with linſeed or ſallad oil, and a plaſter ſpread with bees-wax and oil. If the ſkin be ſo ſcorched, that ſloughs muſt be digeſted out, dreſs the wound with the wound-ointment and oil of turpentine, and finiſh the cure with any drying ointment.

The fire ſuppoſed to be left in the part after injuries of this kind, is nothing more than the inflammation, which is the natural effect of ſuch cauſes: ſo that the whimſical notions and conceits concerning fire remaining in the part, is extremely abſurd. *Bartlet's Farriery, pag.* 251.

BURNT-CLAY, a manure proper for cloſe compact ſoils, which it opens, warms, and invigorates, and thereby diſpoſes ſuch lands to part with their vegetative virtues.

A correſpondent of the editors of the *Muſeum Ruſticum*, tells us, that he has experienced the efficacy of this manure on wet, cold land; and given the following method for preparing it.

" I cauſed, ſays he, a labourer to dig as much clay as made a number of walls nine inches high, the ſame in thickneſs, and placed at the ſame diſtance from each other, in the ſame parallel direction, forming a ſquare of about three yards. Theſe vacancies, being like tunnels of brick-kilns, I filled with bruſh-wood, and on that threw ſome cinders or ſmall coal, of which I had ſufficient quantities, living then near ſome collieries; after which I covered the whole ſquare with clay about three inches thick, leaving the ends of the tunnels, open, which I then lighted on the windward ſide: as ſoon as the fire had got ſufficient head, I ſtopped the mouths of them; and when I perceived the covering was almoſt burnt through, I had a ſmall ſprinkling of cinders or ſmall coal, thrown on the heap, and then another covering of clay of the ſame thickneſs; and thus I went on till my fire was ſeven or eight feet high.

" When I found my fire was very well kindled, which was commonly about the time I put my ſecond coat on, I uſed to enlarge the baſe of the fire, by continuing

continuing the tunnels, and by adding new ones to the fides (which were filled and covered as the others, and then lighted) till I made my fire about feven yards fquare; for I foon found it never burnt well in the middle, if it was too large at firft.

" Care fhould be taken that the labourer does not put on too thick a coat at once, as it will be apt to fmother the fire: befides, by confining the heat in too much, the clay was apt to run and vitrify, which was then of little ufe.

" As foon as the heap was fufficiently cool (for the fooner it is laid on the land the better) I put about ten large cart loads on a ftatute acre, and found it an admirable manure for either meadow, pafture, or corn: for the latter it will not laft longer than three crops, though longer for the two former: and with this I have made prodigious improvements; but I do not believe it will anfwer for a fandy foil, as it will render it ftill lighter.

" This manure I burnt all times of the year, though flower in the winter than fummer, but always fafteft in windy weather.

" This I fancy may be burnt with brufh-wood, or furze only; which I apprehend will anfwer better between the coats than coal, as it will keep the clay more open." *Mufeum Ruft. vol.* I. *pag.* 407.

BURNT-*grain*, a diftemper common to corn, and too often confounded with fmut, though it is, in fact, very different, and much more dangerous.

The fmut, properly fo called, occafions the total lofs of the diftempered ears; but as the black duft is very fine, and the particles of it have no cohefion, the wind and rain carry it off, fo that fcarcely any thing is houfed in the barn, &c.

The burnt-grain is, on the contrary, often laid in the granary with that which is found, to which it communicates a contagious diftemper, and alfo darkens the flour, and gives it a bad fmell.

The characters of this diftemper are, 1. The plants that produce burnt ears are ftrong and vigorous.

2. The infected ears are not at firft diftinguifhable from thofe that are healthy; but when they are paft their bloom, they appear of a deep green colour, approaching to blue; they afterwards become whitifh, and are then eafily known. As this change of colour is effected by the fun, when a number of white ears have been fuddenly perceived in looking over a wheat-field, the fun's heat has been often thought to caufe this diftemper, or a fog preceding that heat.

3. Though all the ears produced from one grain are commonly infected, yet M. Tillet, Aimen, and myfelf, have met with found ears on plants that had produced others which were infected. We have even found fome ears, part of which only were vitiated, and finally fome grains enclofing partly a white flour, the remainder black duft.

4. In burnt ears, the chaff, or outward coat, was commonly found, with this fingle difference, that when the ears were near ripe, it appeared more withered and dry than in the healthy ears.

5. The bran, which immediately enclofed the grain, is not deftroyed, as it is in the fmut, properly fo called; but has confiftence enough for the grain to preferve nearly its natural form, with a whitifh look.

6. The burnt-grains are fhorter, rounder, and lighter than fuch as are uninfected: they are fometimes larger, fometimes fmaller. The furrow which runs the length of a grain of wheat is fometimes totally effaced, at others is vifible: the piftils at the extremity of the grains are dried up.

7. The bud of burnt-grains is not vifible.

8. Till the blooming feafon, there is very little difference betwixt the burnt-grain and that which is healthy: they are only a little more fwelled. But, in the blooming feafon, the infected ears affume a bluifh colour; the chaff is more or lefs fpecked with fmall white fpots: the grains are of a deeper green, and larger than in a ftate of nature; and, as long as they preferve that colour, they adhere ftrongly to the chaff. The diftemper has often attacked very young ears, while yet enclofed in the fheath. The ftamina on the fides of the grain are then dried up and fickly; the embrio in part takes the deep green colour above-mentioned; the infected ears have not the confiftence of thofe that are healthy; in the fame meafure the diftemper advances, the chaff becomes dry and whitifh.

9. The grains have fome degree of firmnefs. On opening them, which may eafily be done with the nail, there appears an unctuous, dark, brown, ftinking fubftance, not at all refembling the light duft of fmutty ears; the duft of burnt-grain has fome cohefion, and through a microfcope appears to confift of larger particles than that of the fmutty ears.

10. Some time before the blooming feafon, the grains appear to be filled with a whitifh fubftance, a little burnt towards the bottom, and this colour extends by degrees over the whole ear: the grain then appears divided, as it were, into equal quarters by furrows; which difappear as the grain increafes in fize.

11. By what has been faid, it is evident that fmut infects corn much fooner than the burnt-grain.

12. Grains that are much burnt are evidently incapable of fprouting. But I have had fome found grains taken from an ear greatly burnt, which, in a kitchen-garden, have produced very ftrong plants; and though the birds difturbed my experiment, it appeared to me that there were fome found ears amongft many more that were infected.

13. A part of the burnt-grain is bruifed by the flail, and their black duft is fcattered over the found grain; this unctuous duft chiefly fticks to the hairy extremity of the grain near the bud; it there forms a black fpot. Corn fo affected, is called *fpotted grain:* many of the grains which efcape the flail remain entire, on account of their lightnefs; a great deal is feparated by throwing, but the fpotted grain remains as well as many that are burnt; and this is enough to darken the flour, and give it a bad tafte.

14. To remedy this inconvenience, and make the beft bread, they pafs the corn through drum-fieves (*cribles à tambour)* made of pierced iron-plates, like the graters with which they rafp tobacco; the corn is then wafhed, and all the light grains that fwim fkimmed off, which are moftly burnt. The water takes off the fpots, which are but fuperficial; for if a fpotted grain is wiped, the fpot immediately difappears.

With refpect to the caufe of this diftemper, I confefs we are hitherto as much at a lofs as in the cafe of fmut. Some have attributed it to dung; others to fogs; many to the heat of the fun; fome to infects; others to the moifture of the land; and not a few to the feed not being ripe: but thefe opinions are confuted by good obfervations, and by experiments very carefully made. We refer to what has been faid of fmut.

It may feem improbable that a meer fuperficial duft, that only fticks to the bran, without penetrating the grain, fhould be fo contagious as to infect all the grain it touches, with a diftemper; what is more furprizing is, that it fhould injure the organs of fructification only. Yet, however improbable this may appear, the experiments made by Monf. Tillet put it paft a doubt; they fhew that the farmers are not without reafon cautious in avoiding to fow fpotted grain.

As it would take up too much room to mention, at large, all the experiments made by M. Tillet, which are to be found in the papers publifhed by him on that fubject, I fhall content myfelf with relating the refult of thefe experiments, and the inferences this able naturalift draws from them.

Several writers having mentioned dung as the immediate caufe of this diftemper, and others having afferted that it was hereditary, all M. Tillet's experiments were calculated to clear up thefe two points: he was at the fame time in hopes, by means of the fame experiments, of finding fome method of guarding againft this terrible diftemper.

1. The feveral kinds of dung had no vifible effect in producing burnt-grain. The infected feed produced as much burnt-grain in the ground that was not dunged as in that which was. He did not find that dung had any effect, either in favour of, or againft the diftemper.

2. Dung made of the ftraw of infected grain, did not feem to communicate the diftemper; but the infected ftraw unrotted feemed to communicate it. Yet the effect was moft vifible when the duft of burnt ears was mixed with the earth.

3. All grain naturally ſpotted, whether it grew on the land, or was brought from another place, bearded-wheat, ſummer-wheat, and wheat without awns, produced a great deal of burnt grain

4. Picked wheat taken from the fineſt ears, and carefully ſelected grain by grain, that none of it might be infected, being ſowed, ſome in dunged, and the reſt in undunged beds, without having received any preparation, yielded little or no burnt-grain.

5. Some of this ſame picked wheat being ſprinkled with the duſt of burnt-grain, produced as many diſtempered ears as that which was naturally ſpotted.

6. The picked wheat, being prepared with lime and a ſolution of the ſea-ſalt, yielded ſtill fewer infected ears than when unprepared.

7. There were ſtill fewer from what was prepared with lime and nitre.

8. Early or late ſowing ſeemed to be a matter of indifference.

9. It appears by M. Tillet's experiments, ſeveral times repeated, that the duſt of burnt ears is contagious, ſince ſound wheat ſprinkled with it, or ſowed in rills in which that duſt had been put, produced a great number of infected ears. He alſo found that this duſt, though expoſed to a ſtrong heat, as of ſixty degrees, is ſtill contagious, unleſs it is abſolutely burnt by the fire when it has not that effect. Though it is kept for years, its infectious quality continues as ſtrong as ever.

10. Some farmers waſh the ſacks in which they put their ſeed. And it appears by M. Tillet's experiments, that they are in the right; for if the ſacks had any of the duſt on them, it would certainly infect ſome of the ſeed corn.

11. M. Tillet thinks he has obſerved, that the infected plants are more ſuſceptible of injury from froſt than others.

If this is the caſe, hard froſts muſt be ſerviceable, ſince by deſtroying the infected plants, they would have the ſame effect, as if ſuch plants had all been pulled up. The land being cleared of theſe uſeleſs plants, would be better able to ſupply ſuch as are found with nouriſhment, and the crop would be exempt from infected ears, which are a great hurt to it.

12. The black duſt ſo contagious, is not ſo to rye or bere; but the duſt of darnel is pernicious to wheat.

13. Smyrna wheat is leſs ſubject to this diſtemper than other grain; but ſummer wheat is greatly injured by it.

It muſt be allowed that the knowledge which has been acquired of the cauſe of this diſtemper, has put the curious obſervers in a train of finding proper preſervatives. In fact, as the duſt of burnt-grain infects all the grain it touches, it is probable that every method ſhould be deemed efficacious, that is capable of taking away this duſt, provided the virus has not from its firſt contact affected the interior part of the ſeed intended to be ſowed. In this caſe the ſeveral ſieves which we have recommended to be uſed in the preſervation of corn, and the waſhings with fair water, which in many places is uſed on ſpotted grain, may be mentioned as efficacious preſervatives, as well as lime-water which our farmers uſe, the ſtrong brine uſed in ſome provinces of France, and the ſolution of arſenic, of which ſome perſons have made ſuch a ſecret: all theſe preparations ſhould be of ſervice; and, according to M. Tillet's experiments, they are ſo: yet they are often inſufficient. This point, therefore, merited to be cleared up by particular experiments, and with all neceſſary care. M. Tillet ſet about it with ſpirit, and the following are the inferences that may be drawn.

1. The effect of the black duſt on the ſeed is only ſuperficial till it is put into the earth, not at all affecting the interior parts.

2. Therefore every means that can tend to clear them of the duſt, muſt be of ſervice to keep them healthy, and free from the diſtemper.

3. Grain perfectly free from this, and from rottenneſs, will yield no diſtempered plants.

4. Grain blackened with this infectious duſt, may be made healthy by clearing it of ſuch duſt.

5. Sifting ſeed, and waſhing it in ſeveral waters, leſſen, it is true, the effects of the contagion; but this is not ſufficient, as many infected plants will be produced, though the ſeed was waſhed in ſeveral waters.

6. Lime, which is more efficacious than water, is not always enough ſo. I ſhall obſerve, on this occaſion, that ſeed was formerly limed in a manner different from what it is now. The ſeed was then put into baſkets, which were plunged into lime-water very hot. The ſeed was ſtirred in the baſkets, and all that ſwam on the water was taken out with a cullender; by this means they got rid of the infected grain; and the good ſeed was better cleaned, than by only throwing, as they do now, lime-water on a heap of ſeed, which is then ſtirred with a ſhovel, or by only mixing the ſeed with the ſlacked lime reduced to powder.

One of our farmers, a careful man, being obliged one year to ſow ſpotted ſeed, he limed it by immerſion, in the manner above deſcribed; and the year following had no burnt-grain.

Some experiments made in the country of Caux, by M. de Goufreville, have been publiſhed; they evince the good effects of lime uſed in the manner we have mentioned. And what is ſtill a farther confirmation of this is, that whenever our farmers ſow ſeed that has not been limed, their fields are amazingly infected.

7. It is a good precaution to waſh ſpotted grain in ſeveral waters; but it ſhould be ſoaked in brine, and this brine ſhould be abſorbed by lime, by immerſion, as we have deſcribed.

A ſtrong brine of ſea-ſalt is very good, and may be employed to great advantage in countries where ſalt is a merchandize.

9. One part of nitre to nine parts water is more efficacious than ſea-ſalt; this, therefore, ſhould be uſed where nitrous earths abound.

10. Strong alkaline lyes are ſtill better; ſalt wort, pot-aſh, aſhes of tartar, lyes of common aſhes much impregnated with ſalt and human urine, or cows urine, alkaliſed by putrefaction: of theſe various articles ſuch may be choſen as are moſt common. For inſtance, in Normandy aſhes of ſea-wrack, which are very cheap there, may be uſed. This, which is rejected for dying and lyes, as being more impregnated than alkaline with ſea-ſalt, may be advantageouſly uſed in the preparation of ſeed.

11. As it is evident that ſeed picked with care yields very few infected grains, it muſt, of courſe, where a farmer has ſpotted grain, be of great advantage to him to change his ſeed, in order to procure what is uninfected.

12. M. Tillet's proceſs may be comprehended in what follows: if the ſeed is ſpotted, it ſhould firſt be waſhed in ſeveral clear waters, till the black is quite got off; it ſhould then be put into the ſteep. If it is not ſpotted, ſoaking it in the following liquor will be enough. Make ſome lye, ſuch as is uſed for linen, in a bucking-tub, putting four pound of water to every pound of aſhes. If one hundred pounds of aſhes are uſed and four hundred pounds of water, there will be two hundred and forty pounds of lye, to which muſt be added fifteen pounds of lime, which will be enough to prepare ſixty French buſhels of wheat (between ſixteen and ſeventeen buſhels Engliſh meaſure). When this ſteep is to be uſed, it muſt be heated as hot as you can bear your hand in it; the ſeed, being put into baſkets, muſt be plunged into it, and ſtirred with a ſtick; the baſkets muſt then be raiſed and kept up by ſticks on the edge of the bucking-tub for the lye to drain; the ſeed being thus prepared muſt be laid on the floor of the granary till it is dry enough to ſow. If it is prepared long before it is wanted, it muſt be, from time to time, ſtirred with a ſhovel to prevent its heating; with this precaution it may be kept a month, or even a whole year.

We prepared ſome ſeed in this manner at M. Taponat's, near Rochefoucault in 1760; and in 1761 we ſaw with pleaſure that the corn ſo prepared was uninfected; whilſt in the neighbouring fields, a fourth, a third, and even half the crops, were ſpoiled by this diſtemper.

All the trials that have been made evince that acrid ſubſtances are proper remedies for this diſtemper: I alſo believe all the ſteeps to be good; but prefer M. Tillet's, as being more acrid, and leaſt coſtly. I imagine lye that had been uſed for linen might do, only ſtrengthening it with ſome ſea-wrack, and putting twice as much lime. I know this lye to be very acrid, but cannot anſwer for its efficacy in preſerving corn from being burnt, becauſe for ſeveral years paſt we have ſcarcely had any of our grain ſo infected.

13. Several farmers in different provinces have uſed a ſolution of arſenic to prepare their ſeeds. Great complaints have been made in all quarters of it. Among others, a phyſician publiſhed an eſſay to ſhew of how much importance it was to prohibit the uſe of this poiſonous ſteep. He there enumerates all the accidents that have happened to the ſowers, and to the men that made the preparation, of which himſelf was a witneſs. Since M. Tillet has given us a method ſimple and innocent in itſelf, but little coſtly, and of great efficacy to clean ſpotted grain, it is to be preſumed that no body will uſe this pernicious drug, from which ſuch melancholy conſequences may enſue, if by accident any of it ſhould be mixed with the meal, and if the light corn is given to the poultry or cattle; beſides, this poiſoned ſeed muſt kill all the partridges and pigeons that eat the uncovered grain.

As ſome people are fond of making objections, it may, perhaps, be urged, that if the black duſt was ſo infectious, this diſtemper would make from year to year ſuch progreſs, that in the end we ſhould have nothing but burnt-grain. But we need not be apprehenſive in this reſpect: and a year in which much corn is infected, ſucceeds one in which ſcarcely any burnt-grain was to be met with. Scarcely any was to be found in the crops of 1754, 1760, and 1761.

In reflecting on this objection, which has ſome weight, I think I have found an anſwer to it in M. Tillet's obſervations, which is, that hard winters, paſt all doubt killing the diſtempered plants, ſtop it progreſs.

It may alſo be ſaid, that if this diſtemper is only cauſed by the infectious duſt, how can it at firſt get footing in a province that was before unacquainted with it?

It is readily allowed that this diſtemper may be attributed to other cauſes beſides the black duſt: but M. Tillet's experiments inconteſtibly prove this duſt to be contagious; and his reſearches ſupply us with the means of leſſening conſiderably, if not entirely extirpating this diſtemper: thus we may have larger crops, better bread, and corn more proper for keeping. What a ſatisfaction muſt it be to a man to have made a diſcovery ſo uſeful to his fellow-creatures, whoſe chief food is the ſeveral ſorts of grain? We ſhall ſoon ſee whether habit, ſupineneſs, and ill-judged œconomy in the farmers, will not prevent them from reaping any benefit from M. Tillet's labours, who yet propoſes to them ſimple and cheap methods of attaining an end which to them ought to be of infinite conſequence. *Du Hamel's Elemens d'Agriculture, vol.* I. *pag.* 314.

BUR-TREE, a name given in ſome counties to the elder-tree.

BUSHEL, a meaſure of capacity for dry things, as grain, fruits, pulſe, &c. containing four pecks, or eight gallons, or ſixteen quarts.

A buſhel, according to a ſtatute made in the twelfth year of Henry VIII. is to contain 2,178 cubic inches, or eight gallons of wheat; the gallon of wheat to weigh eight pounds troy-weight. Mr. Ray tells us, that a buſhel in Warwickſhire is equal to two ſtrikes, or two buſhels, ſtatute, or Wincheſter meaſure.

The French buſhel conſiſts of four quarters, and the quarter of four litrons, each containing thirty-ſix cubic inches. Conſequently the buſhel contains 576 French cubic inches, which, according to Mr. Greaves's calculation, is nearly equal to 615 Engliſh inches. The French buſhel therefore is to the Engliſh buſhel, as 615 is to 2,178. That is, the French buſhel contains one peck, a quart, and two cubic inches nearly. It muſt however be obſerved, that the French buſhel for oats is double that of any other grain.

BUTCHERS-BROOM, or knee-holly, the name of a plant common in woods in divers parts of England.

BUTTER, a fat unctuous ſubſtance, prepared, or rather ſeparated, from the milk by churning it. *See the article* DAIRY.

BUTTER-BUR, or *peſtilent-wort*, the name of a weed reſembling colt's-foot in many reſpects; but the flowers are purple, and grow in a thirſe. The leaves come out after the flowers decay; and are like thoſe of colt's-foot in ſhape; but three or four times as big. It infeſts meadows and paſture grounds, where it proves a very troubleſome weed. *See the article* COLT'S FOOT.

BUTTER-FLY, the name of a numerous, and well known claſs of inſects.

M. Duhamel has frequently noticed, and made drawings of, a ſpecies of ſmall inſects, ſome of a bright red, and others black, which are found in great numbers in the ears of wheat. He ſuſpected that they fed on a ſweetiſh juice which is in the ear whilſt green: and M. Tillet, who was immediately of opinion that they might do conſiderable damage to the grain, followed them very aſſiduouſly in all their metamorphoſes, of which he has given a full account in a memoire that gained the prize of the Academy of Bourdeaux for the year 1755.

The inhabitants of a conſiderable part of the province of Angoumois have, for thirty years paſt, ſuſtained an hitherto irreparable loſs, by an inſect which begins to devour their corn even in the ear, before it is reaped. This ſcourge deprives them annually of their moſt promiſing crops. It appeared at firſt only in a few hamlets, but ſoon made a rapid progreſs, and has now ſpread to the lands of upwards of two hundred pariſhes. Famine and the moſt fatal epidemic diſeaſes have often taken riſe from leſs beginnings. Meſſieurs Duhamel and Tillet were deputed by the Academy of Sciences at Paris, of which they are members, to enquire into the nature of this inſect, and the means of preventing and curing the dreadful calamity occaſioned thereby. They have jointly publiſhed a ſmall treatiſe on this ſubject, from whence we ſhall extract the following remarks ſo much the more readily, as their means of prevention and cure in this particular caſe may be equally applicable to the injuries done to corn by inſects in general.

This inſect is moſt generally known as a butterfly, very much like the moth which preys on woollen cloths, or the falſe moth which is found in great quantities in the granaries of all countries, and which feeds on corn. M. de Reaumur, whoſe accurate inquiries into nature nothing could eſcape, has minutely deſcribed both theſe inſects.

The butterflies which proceed from the wheat caterpillar are often ſmaller than the falſe moth. Some of them are, however, larger, and longer ſhaped: but, that excepted, they are much like them: they are likewiſe of the claſs of four-winged phalenæ or night butterflies; their wings are long in proportion to their breadth, which is almoſt equal at the upper and the lower end. The colour of the upper wings varies; being ſometimes of a light, and ſometimes of a darkiſh grey brown, but always ſhining when expoſed to the ſun. The poſition of theſe wings, of which the edges are cloſe ſet with long hairs, is horizontal when the inſect firſt ſettles after having flown; but ſoon after thoſe edges incline downward. Its head (Plate V. Fig. 24, 25, 26.) is furniſhed with two antennæ (Fig. 27.) the joints of which, nicely fitted into each other, leſſen gradually up to the point. Its eyes are almoſt as large as thoſe of the falſe moth. Between the antennæ are two beards, (Fig. 28.) which proceed from the lower part of the head and riſe up above it; and likewiſe between the antennæ is a tuft of hairs, which turn up backward.

Theſe inſects do not take any food while they are in the ſtate of butterflies, as will be proved by ſeveral experiments; nor do, or indeed can they, prey upon and deſtroy corn during that time, as is the general, but miſtaken opinion in Angoumois; for they have not even organs capable of doing it the leaſt injury. Their only function then is to procreate their ſpecies.

The males of these butterflies seem, in general, to be larger than the females: but they cannot well be distinguished with certainty, unless they are seen coupled together, which, according to the very nice and careful observations of Mess. Duhamel and Tillet, never is but in the night time, or in a dark place. Their copulation then is like that of the silk-worm butterfly: the body of the male and that of the female then form one strait line; their heads are turned different ways; the ends of their wings rest upon each other; and their conjunction lasts several hours. The abovementioned gentlemen, with many other witnesses, saw great numbers of them in this situation, both upon heaps of corn in granaries, and upon ears of corn in the field. They catched two of them in the act of copulation, and put them into a glass covered over, where they then separated, but were found joined together again the next day, in the evening.

As soon as the female is impregnated, she lays her eggs in great numbers. Messieurs Duhamel and Tillet put a male and female, coupled, into a glass vessel, and, watching them carefully, saw the female, soon after her separation from the male, deposit her eggs, sometimes on one spot and then on another, in heaps of 60, 80, or 90 together. These eggs are squirted out, as it were, commonly by three, four, or half a dozen, and sometimes thirty, at once; and at each squirt of this kind the female changes her situation. Those which were inclosed in glasses cast some of their eggs upon a few grains of corn deposited at the bottom of those glasses, and, finding themselves cramped there, laid others on the sides of the vessel. These eggs are accompanied with a viscous matter which makes them stick to the places they are laid in; and this cohesion soon becomes very strong.

These eggs, as may easily be imagined from the size of the mother and the great number which she lays, are so extremely small that one of them would drop through a hole made in a bit of paper with the point of the finest needle. When examined with a microscope, they look, as in Fig. 4, not unlike the nymphs commonly called ants eggs. They are streaked length-wise, and appear rough or curdled. When first laid, they are white; and afterwards they become red, as if tinged with carmine; owing to the colour of the caterpillar within the egg, of which the shell is very thin and transparent, as is evident after the caterpillar has left it.

By means of the thinness and transparency of this covering, the caterpillar may be seen within the egg, as at *b*, Fig. 5. At first, it is bent, as in Fig. 6: some time after, it wriggles itself into the situation represented in Fig. 7; and then makes a hole through the end of the egg, and comes out there, as in Fig. 8. This opening remains at the end of the empty eggs, as at *c*, in Fig. 5.

It is with great difficulty that the caterpillar gets its two legs out of the egg; but after it has extricated four or six of its legs, it soon draws out the rest of its body. At its first issuing from the egg, this caterpillar looks like a bit of hair about a quarter or a fifth part of an inch long.

These caterpillars generally come out of their eggs on the sixth or seventh day after they have been laid. Some say they have seen them hatch at the end of four days. The temperature of the air will undoubtedly influence this variation. They are red, as was said before, whilst in the egg; but that colour goes off by degrees after they are hatched, and they soon become almost white.

The female butterflies which are upon the ears of corn in a field, endeavour to place themselves in such manner as to lay their eggs close to the place where the grain is fastened to the stalk. Fig. 1. represents some of them, at *a*, in the attitude of thus laying; in which case their eggs are deposited near the bottom of the grains, toward the stalk: but it often happens that, in their hurry to lay, they scatter their eggs in other places, as represented upon the husks in Fig. 2 and 3.

As soon as the caterpillars are hatched, they set about making their way into the grain, in order to feed upon its flour. If the eggs have been laid in the granary, after harvest, and upon the grains themselves, they generally creep into the furrow *a* of the wheat (Fig. 9. and 10), and there weave a slight web *bb*. They then tear a hole in the skin or rind, range around them the particles of the bran thus separated, and wriggle themselves into the mealy substance which is to be their food. The hole through which the caterpillar entered can then no longer be perceived, but by a little heap of bran which lies upon it, as in Fig. 11. This small quantity of pulverised bran, which is a sure sign that a young caterpillar has got into the grain, may easily escape the notice of those who have not observed it before; but when once known, it is easily distinguished.

When the eggs are hatched upon the ears, in the field, the young caterpillars soon find means to glide in between the chaff and the grain, and in that situation they pierce the latter, as was said before, generally in the furrow, but sometimes at the pointed end, which is a little hairy.

To set this in a yet clearer light, it is to be observed, that, in most kinds of wheat, three grains of corn adhere, or are fastened, at the same height, to the spike or stalk which traverses the ear, as at *bbb*, Fig. 1. in such manner as to form a sort of triangle, or flower-de-luce. Each grain is covered with three concave coats or husks, the smallest and thickest of which is represented by Fig. 2 and 3: their inner husk is covered by a broader, but thinner; and this grain is covered by a still larger, from which arises the beard, when there is one. Over all these there frequently is a fourth tegument, or very thin membrane, more or less wide. All these husks lap over each other like the scales of a fish, and envelop the grain. The end *e* (Fig. 9.) is uppermost, and the end *f* rests upon its supporter. The germ is at the end *f*, and the extremity *e* is covered with a hairy down.

The young caterpillar finds means to creep under all these scale-like coverings, and to get at the grain, which, after having wove a slight web of only a few fine threads, either to cover itself, or to hold by, it attacks, sometimes at the upper end *e* (Fig. 9), which is very soft in green corn; and sometimes, if it has crept in at the lower end, it lodges in the longitudinal furrow of the corn, and there begins to mine in the manner before related.

As the husks of barley are harder, and stick much closer to the grain, than those of wheat, it is almost always at the point *d* (Fig. 12.) that these caterpillars slip into that corn, by means of a small opening generally perceptible in that part.

To conceive how these small caterpillars, which are hardly able to pierce the rind or bran of wheat, can glide into barley by means of the opening before mentioned, it is necessary to consider the organisation of this grain. It is formed of two lobes *cc*, Fig. 12. which are partly separated by a furrow in its middle, and partly covered by a tegument *a a*, which fits exactly close and adheres strongly to the lobes *c c*, and terminates in a long awn or beard *b*, of which only part is represented in this drawing. The two lobes *c c* are again covered with their proper tegument, which ends in two small appendices at *d*. Here generally is a chasm or opening, through which the caterpillar penetrates to the mealy substance.

To trace this caterpillar in its further progress after it had crept in at this opening, and consequently disappeared, Messieurs Duhamel and Tillet tore off the appendices *d*, Fig. 13, and found, that after having wove a slender web, it had immediately begun to attack the lobes of the grain of barley, as was evident from the bran around it. After it had made its way entirely into the grain, and was buried there, they saw nothing but the little heap of bran it had thrown up, over the hole through which it entered.

Notwithstanding the industry of this insect, it seems highly probable that the young ones meet with great difficulties in their attempts to get into the grain; since very many of them die before they can effect a lodgment in the mealy substance. This number is so great, that it might induce one to wonder how such quantities of corn can be destroyed by these caterpillars, if one did not consider the vast fecundity of the female butterflies. But the sequel of this account will shew, that if prodigious numbers of them did not perish, it would hardly be possible to save a single grain of any kind of corn.

The people of Angoumois were strongly of opinion, that the mischief occasioned by this insect was peculiar to to the corn of their country, and that what was brought to them from other places always efcaped unhurt. To clear up this point, Meff. Duhamel and Tillet put into different glaffes wheat of the growth of other provinces, and with the grains, in each glafs, fome of thefe butterflies actually coupled. They foon faw the female lay her eggs upon thefe grains, and afterwards beheld the caterpillars hatch, and make their way into the grains. Their farther obfervations proved, that the principal caufe of the fpreading of this evil is, that the infect itfelf, which multiplies exceedingly, is conveyed to other parts with the corn in which it is inclofed.

The caterpillar inclofed in a grain of corn preys upon the mealy fubftance of that grain, till it has eaten it all; by which time the infect has attained its full growth. Whenever a grain was opened (Fig. 19.) in which the caterpillar was not full grown, a deal of flour yet remained: but when this infect was full grown, there remained only the fkin, or bran, fo deftitute of flour, as not even to difcolour clear water. Hogs, though very greedy creatures, and fond of bran, would not touch thefe hulls when given to them unmixed; but they eat them readily enough when mixed with other food.

M. de Réaumur fufpects that when thefe caterpillars have confumed all the flour, they eat the excrements which they had voided whilft young. At leaft it is certain that, upon opening feveral grains in which the infect was young, a number of fmall white pellets, like eggs, was found near the caterpillar; and a half-grown caterpillar being taken out of a grain, and laid upon a piece of glafs at the focus of a microfcope, it was feen to void a quantity of excrements, very white, fmooth, and oval; and when the caterpillars were ready to be metamorphofed in the fpring, there remained only a very fmall portion of dark brown excrements, quite different from the white that were obferved at firft.

The length of the corn-caterpillar, when full grown, is very little more than the twelfth part of an inch; and its thicknefs is, at moft, equal to half the circumference of the grain that contains it: its body is fmooth and entirely white: it is thickeft towards the head, in which one may perceive its mouth, two large eyes, and two kinds of horns: the head is a little browner than the reft of the body. This caterpillar has fixteen legs, of which the eight intermediate and membranous are only fmall prominencies, fo minute as not to be diftinguifhed even with the help of a microfcope, unlefs the infect be laid upon its fide.

Our authors make here the following digreffion, to fhew the difference between this infect (Fig. 23.) and the falfe moth (Fig. 31.); it being the more important to diftinguifh them, as they are very much alike in many refpects, and often blended together in the fame granaries.

The falfe moth proceeds from a fmall caterpillar, the body of which is fmooth and whitifh. It has fixteen legs, does not lodge in the grains of corn, but contrives to faften feveral of them together with a web which it fpins, and with which it makes itfelf a dwelling place like that of common caterpillars. This dwelling-place, or fheath, in which the caterpillar of the falfe moth ufually abides, is generally in the middle of the little heap of grains which it has collected for its food, as in Fig. 30: but, which diftinguifhes it from the caterpillar of the true moth, it can quit this fheath at any time, to eat the grains around it, one after another. It generally attacks feveral grains at once, and always without order, eating fometimes of one, and fometimes of another, fo that feveral are gnawn when not one is wholly confumed. When thefe infects are very numerous in a granary, all the grains upon the furface of the corn are linked together by a web, fo as to form a cruft which is fometimes three inches thick. This caterpillar turns into a chryfalis, or aurelia, in a grain which it has hollowed, or in the fheath of its web, and iffues from thence, in the month of June, in the form of a butterfly. When a heap of corn is ftirred in which there are many caterpillars of the fpecies of this falfe-moth, thofe infects crawl up the walls: but they foon return to the heap, and, by the very next day, cover it all over with a new web.

The infect which defolates many parts of Angoumois is more fparing of the mealy fubftance of the corn, than the caterpillar of the falfe-moth; for the former feldom confumes more than the contents of a fingle grain. Nothing is more uncommon than for it to pafs from one grain to another, even though it be immediately contiguous. It eats the flour in fuch manner that the fkin or rind of the grain, which is entirely emptied, looks whole and found: but the leaft preffure then eafily reduces it to powder; and it rifes up to the furface of water more or lefs quickly, according as the infect has left in it more or lefs flour.

As heat haftens the metamorphofis of the infect, it is not unufual to find, in very hot weather, fome of thefe caterpillars transformed into aureliæ, before they have confumed the grofs excrements before-mentioned, or even eaten all the mealy fubftance of the grain. In this cafe, the aureliæ are very fmall, and produce only fmall butterflies. The fame happens to other infects of this kind. Silk-worms eat but little when they are fickly, and, if that ficknefs continues, they are metamorphofed fooner than others which are healthy; but then their cocons always are fmall. If a field caterpillar be fhut up in a box before it has attained its full growth, it will, after having fafted fome days, be converted into a fmall aurelia, from will iffue a butterfly fmaller than others of the fame fpecies. In like manner, when one fees among the corn caterpillars fome larger than others, it may reafonably be prefumed that this difference proceeds from there having been a greater quantity of flour in the grains on which they fed, than in thofe which were the nourifhment of fmaller flies; or from their having been of a ftronger conftitution. It likewife appears that fome of thefe caterpillars are fo much more voracious than others, that the flour of one grain is not fufficient for them. M. Duhamel put feveral of them into a box of flour: they throve there, and feemed to grow larger than in their common way of feeding in the grain.

In general, they are matamorphofed much fooner in fummer and when the air is warm, than in winter, or in cold weather. It may likewife be obferved, that the mealy fubftance of a grain is more completely confumed when the metamorphofis is flow, then when the contrary happens.

The fagacity of M. de Réaumur was requifite to difcover a fingular circumftance relative to the working of this infect, and of which Meff. Duhamel and Tillet have been witneffes. The caterpillar, exactly inclofed in its grain, forefees, or acts as if it knew, that, in its future ftate of butterfly, it will be deprived of the organs neceffary to pierce through the rind of bran which forms its prifon. However, whether it has or has not that forefight, the fact is, that the caterpillar, before it is changed into an aurelia, makes in this covering of bran a fmall trap *a* (Fig. 21.) which remains fhut. Meffrs. Duhamel and Tillet could not eafily difcover it at firft; but after fome fearch, a little fpot whiter than the reft, about as big as the head of a fmall pin, and fomewhat prominent, fhewed them where it was. They then, upon lifting up this trap (Fig. 22.) with the point of a fine needle, could fee the chryfalis in the infide of the grain, and could alfo, fometimes, clofe the trap again fo exactly, as not to leave the leaft appearance of a hole.

When the caterpillar has attained its full growth, and formed its trap, or outlet, it weaves a cocon, and is afterwards metamorphofed, within the grain, into an aurelia (Fig. 20.) which feems at firft to be divided by ringlets (Fig. 14.): but when the butterfly is formed within the aurelia, its wings may be difcerned through the membranes which cover it, as in Fig. 15, 16, 17, 18. The above-mentioned accurate obfervers opened fome of thefe aurelia in an advanced ftate, and took out of each of them a butterfly greatly rumpled and benumbed. When one of thefe caterpillars firft iffues out of an egg, and when a full grown one is taken out of a grain of corn, the body of each, then feemingly more at eafe, dilates, fo that one can hardly conceive how it could be contained in fo fmall a fpace as that from whence it came. The cafe is different when one opens a grain in which there is an aurelia; for it is eafily feen that

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this occupies little more than half of the inner capacity of the grain which incloses it, and that the caterpillar, in forming a cocon, has divided the grain into two spaces or cells, in the largest of which, being somewhat more than half, the aurelia is lodged, whilst one sees in the other nothing but its excrements. The aureliæ are therefore small in comparison to the caterpillars that were metamorphosed into them. Nor is it less surprising how a butterfly just come out of the aurelia could be contained within that covering.

The butterfly, being entirely formed in the aurelia, breaks the skin of it at the end, opens with its head the little trap which the caterpillar had made on the outside of the grain, and comes out at the little hole which was covered and shut by that trap. The mealy substance of the grain has, by that time, been so far consumed, and the outside husk or bran rendered thereby so light, that the butterfly, after having disintangled its wings, takes its flight, and sometimes carries away the empty hull. As soon as the butterflies are out of the grains which contained them, they couple, and the females lay their eggs in the manner before related. Such is the circle of their life.

This insect, like all others of the same species, remains, as was said before, a longer or shorter time in its different states, according as the temperature of the air is more or less favourable to its several changes. It is known that an aurelia of a caterpillar, which generally produces a butterfly in eight days, will continue three months in the state of an aurelia, if it be put into an ice-house, and that the butterfly does not, in that case, come out, till after it has been removed into a much warmer air. For this reason one cannot fix precisely the time within which the caterpillars are transformed into aureliæ, nor how long they remain in this state: it can only be said, that they come out of their eggs very soon when the air is warm, and that they sometimes continue long in the state of caterpillars, as well as in that of aureliæ, if the weather be cold: to which may be added, that both caterpillars and aureliæ, of different sizes, are seen in the field in warm weather; that butterflies are seen to issue out of corn from harvest till the end of September; and that caterpillars of various sizes may be found in the infected grains during the whole winter.

"In the middle of May 1761," continue Messieurs Duhamel and Tillet in their account of this insect, "when we arrived at la Rochefoucault, there were many caterpillars in the corn, very few aureliæ, and not many butterflies. The weather was then very dry, and the nights were cold. On the 21st, the wind changed to the west; and in a few days after it began to rain, and continued so to do till the end of the month. During this time the thermometer was at from 13 to 14 degrees of Reaumur, or from 56 to 58 of Farenheit.

"In the beginning of June, we found in the grains of corn many more aureliæ than caterpillars; and on the 5th of that month, the air being then become pretty warm, we saw numbers of butterflies. By the 15th, they were increased so prodigiously in the closets where we made our experiments, that they perfectly darkened the day, and flew into our mouths if we opened them. We could then find but very few caterpillars, except in the corn which had been laid in cool places. We believe that the duration of the life of the butterflies is, in general, a fortnight or three weeks; though some of them have lived a month in our glass vessels. The sequel will shew that the whole circle of the life of this insect may be completed in less than fifty days, when the air is warm.

"The coming out of the butterflies is generally denoted by a great heat in the heaps of corn, or in the sheaves, according as the grain is laid up in one or other. It was such as to make the liquor in M. de Réaumur's thermometer rise to 25 and 30 degrees (from 62 to 71 of Farenheit) when the outer air was at 15, (35 and a half of Farenheit). This heat certainly accelerates the hatching of the insects; for prodigious multitudes of butterflies issue out of the heated corn in a few days after the ferment has taken place.

"The coolness of autumn interrupts their propagation; and no more butterflies appear from that time, till the warmth of spring begins to be felt. But, may not the heat which favours the multiplication of these insects be produced by the creatures themselves when assembled in vast numbers? This is very possible: for it is well known that there is a considerable warmth in well stocked bee-hives; and that corn greatly infested with weevils or moths, is also very hot. We shall hereafter have occasion to observe that no sensible heat is perceived in heaps of grain in which there are but few caterpillars, and that the heat abates after most of the caterpillars have been changed into butterflies. It sometimes happens that, through some cause or other, the heat goes off soon, and at other times it lasts three weeks or even a month. Perhaps too this great heat of corn full of caterpillars may proceed from the moisture which those insects occasion, and from thence may arise a fermentation capable of hatching the eggs, of making the caterpillars grow, of hastening their transformations, and of bringing forth the butterflies, at the same time that it damages the corn, which thereby contracts a bad smell. It is certain, that when the harvest is wet, and warm rains fall at that time, the corn heats very soon, and then these insects make an extremely rapid progress. The heat which the corn contracts is doubtless very favourable to that progress, and the insects certainly may then attack the grains softened by the moisture, more easily than they can those which are hardened by drought. Accordingly, in 1760, a year in which the heat was great, and the air very dry, the corn in Anjou kept cool so long that many of the inhabitants of that province thought there would be but few insects, and that the great heat of the sun had killed most of the caterpillars. They flatter themselves with the same hopes whenever these insects do not appear in great numbers quite so soon as usual, and imagine that few or none of them will come afterwards: but in that very year, which they thought so fatal to insects, we saw butterflies come out of the ears of corn while they were in the reapers hands; we saw still more fly about the sheaves laid up in barns, and an inexpressible multitude upon the surface of corn deposited in granaries, though neither of these grew very perceptibly hot till about the middle of September. In 1761, the corn was so much heated on the 8th of September, that though the outward air was of the same temperature as that in the vaults of the observatory at Paris, Réaumur's thermometer placed in one of those heaps rose to 53 degrees, (131 of Farenheit's). The great heats of the summer had therefore only deferred the evil, and perhaps lessened it a little. But this dreadful scourge returns every year. These caterpillars, inclosed in their grain of corn, and sheltered in barns or granaries, are screened from the vicissitudes and rigour of the air which destroy other insects that are exposed to them.

"Let us now review our insect in all the seasons of the year, in order to try to find under what circumstances it may be attacked with most advantage.

"At harvest-time, we saw butterflies come out of some grains, which were already empty and entirely consumed, before they were reaped. Doubtless these first butterflies couple and lay their eggs upon the other unreaped ears, and probably part of those eggs are destroyed by the action of the flail, when the corn is threshed and cleansed soon after its being cut: but as the caterpillars are hatched very speedily in hot weather, and many of them can, as in fact we saw them, enter into the corn that is reaping, and shelter themselves there; they will do all their mischief, if speedy care be not taken to stifle them, as we shall hereafter observe.

"The reaped corn is laid up in sheaves, in barns, till the husbandman can find time to thresh it, which is sometimes sooner, and sometimes later. The corn thus piled up, heats; and the transformations of the insects inclosed in it are then the sooner effected. When any of these piles of sheaves were stirred in our presence, we saw butterflies come out of them, and the grains from which they issued were empty of flour, and absolutely spoiled. The moment these butterflies are out of their pfifon, they couple, and lay their eggs upon the ears which they find in the barn. Part of thefe eggs, and of the young caterpillars, might certainly be deftroyed by the flail and winnow, as we faid before, if they were ufed fpeedily.

"Many peafants in the country we are fpeaking of make all the hafte they can to threfh their little crops, which they generally do upon a very dirty floor made in a hurry in the open air. They winnow and cleanfe their corn as foon as it has been threfhed; and the empty grains are then partly feparated from thofe that are full, by the wind, which carries the lighteft away with the chaff.

"As the dirtinefs of the floor on which the fheaves are threfhed fouls the grains of corn, thefe people wafh them, and thereby take off fuch of the remaining light grains as fwim upon the water. They likewife feparate the grains of which the caterpillars have eaten fo much of the mealy fubftance as to render them fpecifically lighter than the water: but the grains of which the caterpillars have not eaten much of the flour, fink to the bottom with found ones; and the caterpillars devour thofe infected grains after they are foftened by the water, much fooner than thofe which are thoroughly dry.

"Moft of thefe peafants, knowing the ill fate that will attend their corn, fell it as foon as poffible to dealers, who carry it into the neighbouring provinces, and with it the contagion. This is the real caufe which fpreads the evil. Others have their corn ground immediately after harveft; and this is the beft method they can take, though not without its inconveniencies: for, in the firft place, there are not mills enough in the country to grind immediately the whole produce of the crop; fecondly, the meal of corn gathered in a wet harveft will not keep long; and laftly, though the friction of the mill-ftones undoubtedly deftroys almoft all the infects, it is not certain but that fome of them may efcape; and in that cafe they will thrive, and go through their feveral metamorphofes, firft into aureliæ and afterwards into butterflies, in the flour, as we have experienced in the manner before related.

"Several of the inhabitants of the country in queftion lay their corn up in granaries, in order therewith to pay their rent, which, in general, is not due till the beginning of October. From thefe heaps of referved corn iffue multitudes of butterflies, which, as we have obferved, couple and lay upon that corn an immenfe quantity of eggs, from whence proceed caterpillars which get into the grains, and devour their infide during the whole winter.

"It is highly probable that, in mild and moift autumns, fome of the firft hatched caterpillars may be changed into butterflies early enough to produce a fecond generation before winter; nor will this feem furprifing to thofe who know how rapidly warm weather makes thefe infects go through all their metamorphofes. But, independant of this, it is certain that butterflies are continually feen to come out of all the heaps of wheat, barley, and rye, in Anjou, during the whole fummer, and till the autumn begins to grow cold; that numbers of live caterpillars are found in the grains during the winter; that many aureliæ are found in them towards the end of May; and that prodigious multitudes of butterflies iffue from them as foon as the weather begins to be hot, that is to fay, towards the middle of June.

"Thus we fee that there are, in a manner, two flights of butterflies; one which appears from harveft time till the weather grows cold in September, and the other which appears in June, and lafts till harveft. The former, in our opinion, proceed partly from granaries in which corn of the preceding year has been laid up with young caterpillars in it, and partly from the eggs firft laid upon the ears, towards the end of May, or upon the new reaped corn; fo that the fecond flight begins juft as the firft flight ends.

"A circumftance well worth obferving, and which will be more particularly noticed hereafter, is that moft of the butterflies of the fummer flight remain in the granaries, faft clung to the threfhed corn, upon which we have feen them couple and lay their eggs. It looks as if thefe butterflies knew that there then no longer is in the fields any corn fit to feed their pofterity. On the contrary, thofe of the fpring flight endeavour to get out of the granaries, and do in fact get out in vaft numbers, through the windows, to fpread in the fields, and lay their eggs upon the yet green corn."

That this is really the cafe, and that thefe infects are of the fpecies called *phalenæ*, appeared evidently from feveral very accurate obfervations, made by Meffrs. Duhamel and Tillet, and of which it may be fufficient to mention here only the following.

In June 1761, they went, at different hours of the day, into granaries where there were heaps of corn infected with thefe infects. While the day lafted, they perceived a multitude of butterflies which ftirred a little upon thofe heaps, but did not quit them. When they returned into the fame granaries a little after fun-fet, they faw thofe butterflies rife from the corn, and fly to the walls, where they fettled for a while; after which they took their flight in vaft numbers, through the windows, and went off with fuch rapidity that they foon got out of fight. If Meffrs. Duhamel and Tillet went back into thefe granaries at ten or eleven o'clock at night, they no longer faw fo great a number of butterflies, and thofe that did remain feemed to be lefs agitated.

To be ftill more perfectly acquainted with fome circumftances of the life of this infect, they put different forts of corn into fmall clofets, in September 1760, after having pafted white paper all over the walls and ceiling. In the beginning of June 1761, thefe clofets fwarmed with butterflies, which feemed to be pretty quiet during the day, and were feen to be greatly agitated towards the fetting of the fun: but they could not get out of the clofets, becaufe the windows were clofely fhut. On the 9th of June, towards eight o'clock in the evening, one of the clofet doors being opened, a prodigious number of butterflies immediately iffued out, and, with furprifing fwiftnefs, traverfed an oppofite granary, without making the leaft ftop, though feveral heaps of wheat lay in it. They bent their courfe directly to an open widow of the granary, at fome diftance from the clofets, and inftantly haftened out. Several people, who were prefent, followed them with their eyes, till the ridge of a barn near forty feet off, and the decline of the day, prevented their feeing them any further. Our obfervers returned to the fame clofet at about ten o'clock at night, and then found the remaining butterflies very quiet, fcarce one of them attempting to fly out.

Thefe obfervations prove fufficiently that this fpecies of butterflies is nocturnal, and that thofe of the June flight have a different inftinct from thofe which do not appear till after harveft. Thefe laft remain upon the corn in the granary, and there couple and lay their eggs, from whence proceed caterpillars which penetrate into the grains as foon as they are hatched. The June caterpillars, on the contrary, act as if they knew that the bloffoming of the corn is paft, and that its ears are fitted to fupply their pofterity with the neceffary food. They feldom leave the granary before fun-fet, unlefs dark clouds chance to beguile them earlier, in which cafe numbers of them become the prey of fwallows and martins, which fly about the windows.

As thefe little infects fly very fwiftly, and rife to fuch a height that the eye cannot follow them long, efpecially when the dufk of the evening begins to come on, Meffrs. Duhamel and Tillet were obliged to try feveral methods before they could be certain what became of them. The caterpillars which they found in the grains of ftanding corn made them conclude that the butterflies, when out of the granary, flew directly to the green corn, and laid their eggs upon its yet tender ears: but none of the country people, of whom they inquired, had ever obferved them in the fields, or could give any fatisfactory account of them. Another well attefted circumftance, which ftrengthened their conjecture, was their being affured by perfons of undoubted credit, that the corn which grows neareft to villages, farm-houfes, barns, or buildings ufed for granaries, is always much more da-

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maged by insects than that which grows at a distance from any habitation. Their own observations confirmed this fact; and their experiments, dictated by reason, soon proved that they had conjectured right.

Desirous to know what was become of the swarms of butterflies which they had seen go out of the granaries in June 1761, they searched all the neighbouring fields of every kind of corn, and beat even the surrounding hedges, at all hours of the day, to no sort of purpose: not a butterfly could they find, excepting a few dead and dried ones intangled in spiders webs along the outside of the corn. This very circumstance led them to the discovery they were in quest of: for, rightly reflecting that these insects, which neither they nor any other persons had been able to find in the fields in the day time, must certainly be of the *phalenæ* or nocturnal kind; they, without farther delay, set out with a candle and lanthorn, repaired to one of the corn fields which they had visited in the afternoon, and, in the night between the 5th and 6th of June, soon descried a great number of the very butterflies they were seeking for, upon the beards of the ears of wheat. They returned to the same spot early the next morning, and could not then find a single one.

From that time they saw and shewed to whoever chose to see them, a great number of these butterflies upon the standing wheat and barley. Some were upon the beards, and others had made their way to the point of the grain. Scarce an evening passed without their seeing some of them coupled. Though every circumstance concurred to prove, and indeed left no room to doubt, that these butterflies were the same as those which infested the corn in granaries; yet, to be thoroughly convinced, and to convince others, in this respect, they took some of them from off the ears of corn in the field, examined them with a microscope, and found them to be of the very same species. A farther demonstration of this resulted from the following incidents. M. de Taponnat, one of their friends in Angoumois, had, in a small granary, several heaps of wheat differently prepared, which he kept by way of experiment. Messrs. Duhamel and Tillet observing numbers of caterpillars in two of those heaps, advised him to put that corn into an oven properly heated, in order to prevent the dispersion of the butterflies, which they knew would otherwise infallibly proceed from thence: but this was neglected. On the 21st of June, about seven o'clock in the evening, they visited this little granary, and found upon the corn a multitude of butterflies in great agitation, and of which a considerable number soon flew out at the windows. They took leave of M. de Taponnat, assuring him that this flight of insects would soon light upon his standing corn. When they were gone, M. de Taponnat had the curiosity to step out, to see whether any great quantity of butterflies still continued to issue from his granary; which he could easily do, as the window was very low. He was amazed at the numbers he saw fly out at that one window; being, as nearly as he could compute, about fifty in a minute. He observed, that they directed their flight towards a field of wheat not far off, and thereupon went thither with five or six other persons, all of whom saw them arrive in swarms, proceeding chiefly from the granary. They saw many of them light upon the ears, and on their running a cane gently over the awns, beheld them rise by dozens at a time. M. de Taponnat was so struck with this sight, that he ordered the window of his granary to be shut the next day, and his corn to be put into an oven properly heated, as soon as possible.

A clergyman in the neighbourhood, who had a little barley infested with these insects, could not be persuaded to do the same, though his whole quantity was but a few bushels. The consequence was, that a multitude of butterflies were soon seen to proceed from the window of his granary, and spread so thick over an adjacent field of barley, that not an ear could be found without several of them upon it.

These facts confirm all the former remarks of our accurate inquirers, who, after observing that the fittest time to find these butterflies upon the ears of standing corn, is about half an hour after sun-set, continue thus.

"On the 10th of June, about eight o'clock in the evening, we visited the fields around la Rochefoucault, and then perceived only a few butterflies upon the ears of the corn: they were greatly agitated; and we soon after saw numbers of the same species arrive on all sides, but chiefly from certain mills on the banks of the river. Those that were upon the corn flew away as soon as we approached them with a light. This was probably the time of their arrival. Towards nine o'clock we renewed our search, and saw many of them clung to the ears, either actually coupled, or seeking to couple. The light did not affright them then, and we had time enough to examine them with a microscope. We found fewer of them towards midnight, and could not see any early the next morning. It is not to be supposed that the dispersion of these butterflies happens always regularly at the hours before-mentioned; for we have observed several variations, which depend on the warmth of the air; and they commonly settle upon the corn earlier when the sun is over-cast with clouds just before its setting.

"As we have not ever met with these butterflies in the day-time, it may be asked, where they then retire to? This question deserves an answer. We have searched for them in vain in hedges and among the blades of corn. Light certainly incommodes them: for when we exposed to the sun vessels in which some of them were inclosed, they hid themselves in the shade formed by creases of the paper at the bottom of those vessels, in such manner that we were sometimes puzzled to find them again. One day that the sun shone very bright, we took two crystal cups, into one of which we put a few grains of wheat with some butterflies, then covered it with paper, and placed it upon its bottom, in a garden exposed to the sun. We put some butterflies into the other, but not any corn, and placed it close to the former, with its bottom uppermost, that the butterflies might receive the full heat of the sun: and lastly, we set one of M. de Réaumur's thermometers upon the ground, just by these cups. When the liquor had risen to from 45 to 50 degrees, (from 112 to 124 of Farenheit's) we saw that all the butterflies in the cup where there was not any corn, were dead: in the other, only some were dead; because most of them had found a shady shelter, either by making their way into the grains, or by hiding themselves under the paper cover. We knew before, that these butterflies are greatly agitated, and flutter very much when they are exposed to the sun; but we could not tell whether that proceeded from pleasure or pain. The doubt is now removed; and we are of opinion that they retire to a cool or shady place during the day time, and that their smallness prevents our finding where they are hidden, which may perhaps be in woods or thickets, in crevices in the barks of trees, or in the earth."

That the caterpillars which produce first aureliæ, and then these butterflies, can, and frequently do, live under-ground, that they can pass the winter there inclosed in the grain with which they are sown, and even undergo their several metamorphoses in the earth, so as to arise from thence in the form of butterflies in the spring, has been demonstrated by the following experiments.

In May, 1761, Messieurs Duhamel and Tillet planted, in a garden-pot, corn in which they knew there were caterpillars. They buried it an inch deep, watched it carefully, and saw that, notwithstanding plentiful rains had fallen upon it, those caterpillars changed into aureliæ just as if they had been in a granary. These aureliæ produced butterflies, which, weak as they were when first hatched, soon made their way out of the ground.

To be the more certain of their power, with respect to this last article, the same gentlemen put some thoroughly dry, and well pulverised earth into a glass vessel, then laid upon that earth a layer of corn in which they knew there were aureliæ, and covered this with equally well dried and pulverised earth, at least half an inch deep; after which they tied a paper over the vessel, to keep in the butterflies, in case they should pierce through the upper mould. In effect, they did pierce through it, coupled, and laid such quantities of eggs as covered its whole surface.

To see whether these insects would rise as easily from underneath a stiffer earth, and what effect their being buried deeper would have, a wooden box was divided into three partitions, and filled with common mould taken out of a kitchen-garden. Corn known to be infested with these caterpillars was planted an inch deep in one of these partitions, two inches deep in another, and three inches in the third. All of them were then covered with a glass frame, and butterflies soon appeared in each of the divisions; but they were far most numerous in that where they had been buried but an inch deep. In another trial, a number of infected grains was covered with a still stiffer earth, wetted, and pressed down; and not any butterflies appeared there. At their first coming out of the ground, they are rumpled, as when taken out of a chrysalis: but after resting a moment, they shake their wings, set them right, and soon take their flight.

That some of these butterflies can, and do come out of the ploughed ground which has been sown with infected seeds, is certain: but Messieurs Duhamel and Tillet are thoroughly satisfied that their number is but small, that most of the caterpillars sown with the grain perish before they can reach the surface of the earth, and that the butterflies which proceed from granaries are the great source of the increase of this insect: for, say they, the grain which contains a young caterpillar will grow, if its germe has not been damaged; and as its mealy substance is consumed by the plant, the caterpillar must die for want of food. Besides, as is proved by the last-mentioned experiment, the butterflies cannot pierce through a close and hardened earth; which generally is the case of ploughed land that has been exposed to the winter rains.

After observing that the two sexes sometimes unite a second time after separation; that the female deposits her eggs almost immediately after they are fecundated, in small parcels of from 6 to 30, and that each female lays in all from 60 to 90; adding to this, that there are generally three flights in a year, one at the latter end of May or in the beginning of June, a second in August, and a third in some of the subsequent months, during which a fourth also, and even a fifth, have been known; we may, from the following calculation, form an idea of the astonishing multiplication of these insects, and consequently of the ravages which they must make where they have established themselves.

Every female produces from 60 to 90 eggs, of which 75 is the medium: but let us suppose the number to be no more than 70. Let us suppose also, that of those 70 eggs, one half only produces females, which makes the number 35. This multiplied by 70, the number of eggs laid by each, gives for the second brood, from a single insect, 2450: the half of this number, supposed to be females, is 1225, which multiplied by 70, gives 85,750 for the third brood. The half of this number, being 42,875, multiplied by 70, gives for the fourth brood, 3,001,250; and the half this, 1,500,625, multiplied by 70, gives 105,043,750 for the fifth brood: so that supposing five broods in a year, each female butterfly of this species that exists in May, produces, before the May following, no less than one hundred and five millions, forty three thousand, seven hundred and fifty individuals of the same kind.

It is not agreed whether these insects prefer wheat, barley, or rye. The observations and trials made by Mess. Duhamel and Tillet seem to prove, that they attack indifferently whichever lies most convenient for them; and that they do not spare maize, when it is stripped of its stalk and laid up in a granary, where they can come at the soft inside part of the grain; or even oats, though it be the common, but mistaken opinion of the people of Angoumois, that this last grain is a preservative of others, especially of barley, when sown with it, or intermixed in the same heap.

M. Tillet inclosed several ears of standing oats in a wide-mouthed glass bottle, and put into it some of these butterflies; after which he covered the mouth with a piece of fine linen. The butterflies coupled there, laid their eggs upon the ears, and several caterpillars which proceeded from those eggs, actually introduced themselves into the grains. A manifest proof that, though the pendent position of the grains of oats, whilst growing, may be inconvenient to the female butterflies, many of whose eggs may be washed or blown off, more easily than from other corn, before they are fixed by the viscous matter which fastens them to the husks; yet the corn-caterpillar can live upon oats. What is still more extraordinary is, that grains of wheat, barley, rye, and oats, were mixed together in a glass vessel, into which some of these butterflies were put: and the oats were damaged by caterpillars, as much as any of the other grain: though it is certain that these insects do but little mischief to oats in the granary; happily for the poor people who make bread of this corn.

In guarding against these insects, the farmer has three objects: 1, to preserve his grain for seed; 2, to keep it for food and market; and, 3, the total destruction of the insects.

To preserve the corn for seed, it should be threshed out as soon as possible, in order to prevent the transformation of the caterpillars brought from the field, which otherwise soon become butterflies, whose prodigious number of eggs would exceedingly increase the evil. For want of this precaution, two thirds of the store of seed-corn has frequently been destroyed.

The seed should either be dried in an oven, in which the heat should be strong enough to kill the caterpillars, without destroying the vegetative power of the grain; which will be properly effected by 124 degrees of heat on Farenheit's thermometer, or soaked in a strong lye of wood-ashes and quick-lime, heated to such a degree that the finger can just bear it. Let the corn contained in a basket be stirred in this lye, and the grains skimmed off that float on the surface. When the corn has been thus soaked for about two minutes, the basket which contains it should then be lifted up, and suspended by two poles, till the lye is drained off. The grain should then be spread very thin on the floor of a granary to dry, while a second basket-full is prepared in the same manner. The corn thus steeped, and well dried, will keep a year, and continue fit for sowing.

By following the above directions, corn may be preserved from the ravages of these or any other similar insects that prey upon it. *Histoire d'un Insecte qui devore les Grains de l'Angoumois.*

BUTTER-JAGS, flowers of the wild trefoil.

C.

CABBAGE, the name of a plant well known, and of which there are feveral fpecies cultivated in gardens, and alfo in fields as a food for cattle.

Cabbages of all fort delight in a deep, rich, light, and well-loofened ground, in an open fituation. They will indeed grow in any ordinary ground that has been dug; but the better the foil and its tilth are, the finer and better flavoured the plants will prove.

The early and the fugar-loaf cabbages, are the forts generally fown for fummer ufe. The moft proper feafon for fowing them is about the end of July, or beginning of Auguft. When the plants have feven or eight leaves, they fhould be removed into beds of well prepared mould, and there fet about three or four inches afunder every way, that they may grow ftrong, without running up in height: and towards the latter end of October they fhould be again tranfplanted in the place where they are to remain. They fhould be here fet in rows three feet afunder, and two feet and a half diftant from each other in the row. They muft be kept clear from weeds, and fhould either be earthed up from time to time, as is the common practice, or, which will be much more beneficial, the ground between them fhould be repeatedly dug pretty deep, or otherwife well ftirred and loofened, during their growth. About May they will turn in their leaves for cabbaging; and if this be then affifted by tying them up pretty clofe with a flender twig of ofier, their heads will be blanched in the middle, and fit for cutting, at leaft a fortnight fooner than they would be, if not tied up. But it muft be obferved of this early kind, that the cabbaging is foon completed after the leaves begin to turn, and that the heads almoft as quickly afterwards become hard and burft. The fugar-loaf cabbage is therefore more generally planted, becaufe it is not fo clofe leaved, grows and cabbages more flowly, and continues good for a longer time.

The mufk cabbage, which requires exactly the fame culture as the former, will be fit for ufe in October, and will laft till Chriftmas; but is more tender, and therefore more liable to be killed by hard weather.

The common white, red, flat, and long fided cabbages, are cultivated chiefly for winter ufe. The time for fowing them is in the beginning or middle of April. The young plants of thefe forts, like thofe of all other cabbages, fhould be pricked out into fhady borders, when they have got fix or eight leaves, that they may acquire ftrength, and not run up with high ftems; for the fhorteft fhanked cabbages are always found to fucceed beft. Towards the middle of June they fhould be tranfplanted from thefe borders into the places where they are to remain, at the diftance of two feet and a half from each other, in rows three feet and a half afunder; for this will be fufficient either for earthing up the ftems, as is commonly practifed, or for the more beneficial method of digging and ftirring the earth between them. If they are planted out in a dry feafon, they fhould be watered every other evening, till they have taken frefh root.

The kitchen gardeners near London generally plant rows of thefe cabbages between their artichokes, cauliflowers, &c. but they feem, upon the whole, to do beft when planted alone. They will begin to be fit for ufe foon after Michaelmas, and will continue good till the end of February, if the winter be not fo fevere as to deftroy them. This may, however, be prevented by pulling them up in November, trenching the ground up in ridges, laying the cabbages as clofe as poffible, on one fide againft thofe ridges, and then throwing in the earth fo as wholly to bury their ftems. In this manner they may be kept till after Chriftmas: for though their outer leaves may decay, as they often will in very wet or hard weather, their infide will remain found, provided they were large and hard when thus laid down.

That fpecies of cabbage called favoy, require exactly the fame treatment as the foregoing, except that, as they do not grow fo large, they need not be planted fo far afunder. Two feet and a half fquare will be a fufficient diftance between them. They always thrive beft in an open fituation, quite free from trees and hedges; for they are very apt to be greatly preyed upon by caterpillars and other vermin, in clofe places, efpecially if the autumn proves dry. If thefe vermin are not very numerous, they may be picked off by hand as faft as they are feen, and deftroyed by treading them under foot: but when their numbers are very great, the moft expeditious way of deftroying them is, to turn a parcel of hungry turkeys in among them. Savoys are moft efteemed after they have been pinched by the froft.

The management of the Ruffian cabbage, which is fo hardy as to bid defiance to the fevereft winter, requires the fame management, except the time of fowing, which like the favoy fhould not be till late in the fpring, and being very fmall, does not require fo much room when planted out. It fhould alfo have a clear open ground to grow on; but it will not laft long before it will burft, and run up to feed. Many think it a very fweet and well tafted plant, though it is not now cultivated near fo much as formerly. The trading gardeners around London feem to have excluded it entirely from their grounds; perhaps chiefly on account of its fmallnefs; but it ftill deferves a place in private kitchen gardens.

The fea-cabbage grows naturally upon the gravelly fea-fhores of many parts of England, and particularly in Suffex and Dorfetfhire, where many people dig it up from among the gravel, in the fpring, and prefer it to every other kind of cabbage. In that blanched ftate, before its fhoots have been expofed to the air, it is very fweet and tender, and may be eafily propagated in gardens, by fowing its feeds foon after they are ripe, in a fandy or gravelly foil. It will thrive there exceedingly, and increafe greatly by its creeping roots; but its heads will not be fit to cut before the fecond year. To have it in perfection, a layer of fand or gravel, four or five inches thick, fhould be fpread, at Michaelmas, upon the bed in which thefe plants grow, in order to allow a fufficient depth for cutting their fhoots, before they appear above ground; for till then they will be white, tender, and well tafted; but the air renders them green, tough, and bitter. This earthing up, or rather new fanding or gravelling the bed, fhould therefore be repeated every autumn, in the fame manner as is practifed for afparagus. It is the only culture that this fort of cabbage will require.

The beft methods of faving the feed of all forts of cabbages is this: about the end of November you fhould make choice of some of your best cabbages, which you should pull up and carry to some shed or other covered place, where you should hang them up for three or four days by their stalks, that the water may drain from between their leaves; then plant them in some border, under a hedge or pale, quite down to the middle of the cabbage, leaving only the upper part of the cabbage above ground, observing to raise the earth about it, so that it may stand a little above the level of the ground; especially if the ground be wet, when they will require to be raised considerably above the surface. If the winter should prove hard, you must lay a little straw, or pease-haulm, lightly upon them, to secure them from the frost; taking it off as often as the weather proves mild, lest by keeping them too close they should rot. In the spring of the year these cabbages will shoot out strongly, and divide into a great number of small branches: you must therefore support their stems, to prevent their being broken off by the wind; and, if the weather should be very hot and dry when they are in flower, you should refresh them with water once a week, all over the branches, which will greatly promote their seeding, and preserve them from mildew.

When your pods begin to change brown, you will do well to cut off the extreme part of every shoot with the pods, which will strengthen your seeds: for it is generally observed, that those seeds which grow near the top of the shoots are subject to run to seed before they cabbage; so that there will be no loss by this method, but a great advantage. When your seed begins to ripen, you must be very careful to secure it from being eaten by the birds, which are very fond of it: and when it is fully ripe, cut off the stalks, thoroughly dry the whole, thresh out the seed, and preserve it in bags for use.

Cabbages have lately been cultivated for the food of cattle, and by several experiments found to produce a very large increase when managed according to the principles of the new husbandry. M. de Chateauvieux has been very particular in relating the success of his experiments, which we shall therefore give the reader.

"I began, says this curious gentleman in a letter to M. du Hamel, by retrenching the dung; though the spot I chose for my first trial had not received any for several years. It had indeed been well prepared by ploughing the preceding year, when one half of it bore barley, and the other oats. I now made it into a bed, the middle of which was directly over the last year's furrow. I ploughed this bed on the twenty-fifth of September, 1751, in the same manner as if it had been intended for wheat. I planted on it a single row of white cabbages, which I watered to make them take root the better. The length of this bed was one hundred and sixty feet, and its breadth six feet seven inches.

"That I might be able to make a just comparison between the cabbages of this bed, and those of the kitchen garden, I planted a spot of ground in the latter, the same day, with the same sort of plants. This spot had been extremely well dug, and plentifully dunged by the gardener, who took all possible care of these plants during the summer, and weeded them as often as was necessary. Instead of cabbaging, most of them ran up in height: upon which I plucked them up, and planted others in their stead.

"I bestowed the same care and culture on my row of cabbages in the bed, as if they had been wheat.

"On the ninth of March 1752, the alleys were stirred with the plough. On the twenty-fifth of April, I gave them a second stirring with the cultivator. On the third of June they had a third stirring with the plough: and on the twentieth of July, I made my gardener hand-hoe them, for fear the plough should damage several stalks of wheat which grew on the next bed, and were bent, but not lodged.

"These cabbages were never watered, except once, which was at the time of planting them; and yet they were always crisp and firm, even in the hottest days. By this easy and expeditious culture, they attained all the perfection that could be desired; and surpassed those of the kitchen garden, as much in goodness, as they did in bulk. Most of them weighed between fifteen and eighteen pounds, and the smallest between eight and ten. The weight of all the plants which grew on this bed, was 840 pounds."

The intelligent and careful cultivator Mr. John-Wynn Baker, in a report he made to the Dublin Society, tells us, that he also cultivated cabbages after the manner of the new husbandry, on a piece of ground that had bore potatoes the preceding year. It was manured with a compost of lime, earth, and dung, perfectly incorporated. On the sixth and seventh of July 1764, he planted one row of cabbage plants on the middle of every ridge, of about an acre of ground, the plants in the rows being two feet from each other, and the rows five feet asunder. On the sixth of July a fine rain fell, and more on the eleventh and twelfth, which saved the expence of watering, and secured life to the plants.

On the seventh of August the cabbages were horse-hoed, by taking off, at one furrow of the plough, only one side of each ridge, close to the plants: in this manner they remained till the twenty-fifth, when the plough was ran along in the same furrow; by which, with the first furrow, the soil was ploughed about twenty-one inches deep. This being finished, the earth was immediately returned back to the plants, which afforded them fresh nourishment; and in order to give their roots time enough to penetrate this fresh earth, which, by the horse-hoeing, was become very fine mould, they were suffered to continue in this state till the twelfth of September; when they were again horse-hoed, by taking off the other side of every ridge; and on the twentieth the furrow was deepened in the same manner as the former, the mould immediately returned to the plants. On the eighteenth of October a small furrow was thrown up to each side of every ridge, which finished the culture, and restored the ridges to the form in which they were when the plants were put upon them.

The plants all grew luxuriantly; and in the hottest weather were infinitely more brittle in their leaves, than any in the neighbouring gardens; which is a certain indication of health in these kind of plants.

The horse-hoeing was so effectually destructive to the weeds, that the expence of weeding was a mere trifle.

On the eighth of December Mr. Baker cut one row of these cabbages, they then beginning to decay, which is indicated by their bursting. The number was two hundred and fifty-eight, and they weighed sixteen hundred weight, three quarters, and twenty-one pounds; which, at an average, is seven pounds and near six ounces for each cabbage.

The produce upon an acre, on weighing this row, which was five hundred and sixteen feet long, amounted to twenty-three tons, four hundred, two quarters, and fourteen pounds; which Mr. Baker observes is, at least, from ten to seventeen tons less than the product would have been upon an acre, could he have obtained the large, late, Dutch cabbage.

The ingenious Mr. Randall, in a treatise lately published, entitled Semi-Virgilian Husbandry, has given us the following method of cultivating cabbages, according to his newly-proposed system, which is nothing more than the New Husbandry executed by the ordinary implements.

The soil on which the cabbages are to grow, is supposed to be a loam in good heart; and as the Semi-Virgilian Husbandry requires only that the soil should be made exceeding fine, without the assistance of any dung, therefore the land destined for these cabbages must be thrown up to be fallowed, that it may enjoy all the advantages of a winter and summer fallow, so as to be exquisitely well prepared for the reception of the plants about Old Michaelmas.

As cabbages extract their nourishment from a considerable depth, as well as from the surface of the soil, it will be necessary that the land should be double-trenched during the time of fallowing.

The loam, immediately after harvest, is to be turned up, and the workman is to go as deep as he can with his plough, another plough is immediately to follow in the same furrow with a higher earth-board, which will cast the mould over, and bury the ſtubble, if it was not before, by ſome other method, deſtroyed: in this manner the field will, as it were, be turned upſide down, double ſpitted more than a foot deep, and the ſtubble will be ſooner rotted. The harrows muſt then make the ground as fine as the ſeaſon will at that time permit.

The next thing to be done, when the weather will admit of it, is to double trench the land, and lay it up till the ſpring in ſharp ridges.

Here Mr. Randall makes a very ſenſible and uſeful obſervation, namely, that the teams muſt not be ſuffered to go upon the ground till it is firſt tried with a ſpade, to ſee whether the ſoil is dry enough to the depth it was ploughed before; for treading the ground in any ſeaſon of the year, when it is not in order, or ſufficiently dry, is a very deſtructive practice. The ſtandard in this caſe recommended, very properly by Mr. Randall, is, when the mould crumbles or feels mellow between the finger and thumb, inſtead of adhering, ſo as to judge by the touch, whether the parts will give way to the tread, or whether the earth be in ſuch a ſtate of coheſion as to be padded under the horſes feet.

The following directions are given for performing the ridge-work, or laying up the ſoil for the winter.

The ploughman is to begin in any part of the ground he pleaſes, and go one bout, throwing the furrows in ſuch a manner, that they may form a little ridge. When this is done, the horſes muſt turn to the left, and the ſhare-point be put to the end of the trench; then go another bout in the manner already mentioned, the horſes again turning to the left, and continuing to go on in this manner, till the piece of ground is ploughed throughout. If the plough begins cloſe to a hedge, it may ſave ſome little trouble in going over more ground than is neceſſary; and where it can conveniently be done, the plough ſhould croſs the path the horſes went in the firſt operation, as this croſs-ploughing is often a means of ſtirring the baulks made by a former ploughing.

The firſt bout ſhould be drawn out as ſtrait as poſſible, as the reſt will depend upon it; and if the hedge is not ſtrait enough to allow this, the ploughman ſhould begin at ſome diſtance from it for the advantage of a ſtrait line, leaving the ſkirtings near the hedge to be laſt finiſhed. The land will now lie in gentle riſing ridges and regular valleys, ready for the third operation.

In this the ploughman is to go the very ſame ground over again, with the ſame plough, or one a little wider and higher in the earth-board, and throw the mould over the right and then over the left ſide of the firſt ridge, going four inches and a half, or five inches deep, and turning off, as before, continually to the left. This trench-work requires four good horſes to a plough; and the ſecond team, in the firſt operation, if the ground be hard, and has not been ſtirred for a long time, may require five horſes, but not more.

The ground will now lie in ſharp ridges, and deep trenches; and if the work be well executed, the bottom of the hollows, or little ridges, will be near twelve, or at the very leaſt nine, inches below the baſis of the ridges, or ſurface of the ground, and about eighteen inches wide; and the diſtance from the top of one ridge to another will be near three times and a half the width of the plough, as it runs in the ground after the horſes; the breadth of the ground, which each ridge ſtands upon, being about fourteen inches.

In this ſituation the land is to remain till the month of February, when the firſt opportunity that occurs in that month, the ridges and the whole ground being of a proper dryneſs, is to be ſeized for the next operation.

In the firſt place, a pair of ox-harrows, or the heavieſt of all, in many counties called drags, are to be yoked together, and the cattle are to go a-breaſt, not in a line; but two on one ſide, and two on the other, and to walk in the trenches, having a ridge between them; by which means the harrows will move on the crown of one ridge, at the center; and the outward parts, when well guided, will reach to the top of a ridge on each ſide that which divides the cattle. The harrows, which are to go only once in a place, will greatly reduce the ſoil, and pulling down the ridges, the ſoil will be in a manner level, yet not ſo even but that the ploughman may with eaſe diſcover where the ridges ſtood. The ploughman is now to proceed in the ſame manner as when he threw the ground into ridges, keeping the plough-ſhare along the crown of a ridge, which will be viſible enough after once harrowing. When he has gone one bout, which muſt be on the tops of two ridges, the furrows will be turned to the right, and lie pretty flat on that part which was a trench before: thus proceeding throughout the field, the whole will again lie in ſingle ridges, and ſingle trenches; but, if the weather permits, as ſoon as this operation is performed, the ſoil muſt be double trenched, in the ſame manner as the ſecond ploughing of the ſecond operation, when it is laid in ridges for the winter: thus the whole field will again lie under the double work of high ridges and deep trenches.

We are now to ſuppoſe the ridge-work brought forward to the latter end of the ſpring, or the beginning of the ſummer, when weeds begin to grow plentifully.

The ridges muſt, at this time, be pulled down as before, with heavy harrows; but inſtead of going once, the ſervant muſt go twice in a place, and then uſe the lighter harrows, and afterwards the fineſt of all, in order to prepare the ground in ſuch a manner, as to induce a large crop of weeds to grow: but if the weather will permit the horſes to tread on the ground without ſpoiling it, the weeds muſt not be ſuffered to grow more than a plough can bury by going the uſual depth; and when the weeds are turned down, another plough is to follow, and to cover the furrow of the firſt, after which the land is to be harrowed down again as level as poſſible, in order to prepare it for yielding another crop of weeds.

When the ſecond crop of weeds is got to a tolerable height, it may be proper to try, with a ſpade, whether the firſt weeds, which were turned town to the bottom of the ſecond ſtratum, are ſufficiently putrified: if they are, the land is to be ploughed as before; but if they are not, the weeds now growing muſt be turned down by one ploughing by ſuch a depth only as to bury them, and the land muſt be afterwards levelled with a loaded buſh-harrow.

We may ſuppoſe, that by the middle of Auguſt, the weeds firſt turned down will be rotted; therefore at that time the third crop of weeds may be turned down by the double ſpitting, already mentioned, and left in this condition till there is occaſion to make uſe of the land.

Juſt before the time of planting the cabbages, the land muſt be laid as level as poſſible, and by frequent harrowings it will not be inferior to a garden for fineneſs.

The ground being now ready to receive the plants, it will be neceſſary to point out how they are to be raiſed and tranſplanted, which cannot be better done than in Mr. Randall's own words.

" The ground on which the cabbage-ſeed is to be ſown, muſt be exceeding fine, in great heart, and abſolutely clear of weeds, otherwiſe it will be difficult to raiſe the plants in perfection; and, in order to this, the richeſt and cleaneſt piece of ground muſt be fixed on, immediately after the ſame harveſt, when the fallow for cabbages begins, and the nurſery for the plants muſt have all the advantages of fallowing equally with that which is to receive the plants; and about the middle of July the cabbage-ſeed is to be ſown: but as huſbandmen are unacquainted with the manner of ſowing this ſeed, it will be neceſſary to employ an honeſt gardener to perform this buſineſs as it ought; and the ſame perſon may be alſo employed to pick out the young plants upon another piece of ground, in great heart, and clear of weeds, leſt they ſhould draw one another before the ſeaſon arrives when they are to be tranſplanted out for good and all, on the ground whereon they are to ſtand for a crop: one perch will raiſe plants ſufficient for more than an acre of cabbages, from two ounces of ſeed, but it is better to have a great choice, as there will be ſome puny plants in the nurſery, let the gardener, or thoſe who prepared the ground, take what care they can; and the ſeed muſt be procured from Scotland, as the Scotch cabbage-ſeed is the propereſt for this vegetable, when deſigned for the uſe of cattle, as they will grow late, and to an enormous ſize, when they have all the advantages of ploughing among them, during the time of their growth.

" If the gardener is diligent, the expence of thus pricking out the tender plants, at ſix ſquare inches, on about ſix perches and a half, will be about four or five ſhillings; but if the owner can depend upon the nurſery's being clear of of weeds, though the weather be very growing, there is a much cheaper method of raising the plants: for if the gardener, with the above two ounces of seed, to be sown on six perches and a half, takes care to set out the plants with a small hand-hoe, before they begin to draw one another, he may hoe up the puny, and leave none but the stoutest plants, at a proper distance, suppose six inches, asunder, rather under than over. While he is doing this, he may assist the plants he suffers to stand, by giving them a little mould to their stems, and checking any weeds that appear; by this means, the plants will grow to perfection, and need not be removed till they are transplanted out for the crop: and if the gardener sows the seed, and leaves the plants on the same ground, about six inches asunder, one perch will transplant twenty-five, and, consequently, six perches and about a half will transplant an acre, from two ounces of seed on six perches and a half, and set out at six inches from each young plant.

" When the plants are thus raised on the nursery, by either method, pricking them out, or setting them out with the small hand-hoe, and the season is arrived for transplanting them on the ground they are to stand on to be cabbages, the next business is to consider the distance they are to stand from each other, when transplanted; and here we must first observe, that gardeners usually set them about two feet and a half from each other throughout the piece of ground allotted for that purpose; and, during their stay on the soil, they only hand-hoe and earth them up, when on the bed they are transplanted upon, without ever giving themselves any farther trouble about them, being no ways anxious to make them grow to the largest size which they are capable of.

" In an acre there are 4840 square yards, which is about sixty-nine yards and a half every way; but in order to proportion an acre in a piece of ground, if the length be measured, and the above number of square yards, in an acre, be divided by the length, the quotient is the breadth, and both dimensions multiplied together will give 4840 yards. Now, as gardeners plant their cabbage-plants at two feet and a half asunder, this is allowing six square feet and a quarter for each plant, and makes the number of about 6970 plants on an acre; and plants set in two rows, at two feet asunder, and the plants set two feet from each other in those rows, and then measuring out four feet and a quarter from one of those rows, and setting two rows more in the same manner, and so on throughout the ground; when the plants are set in this manner, the number of cabbages will be about 6970, which is the same as the gardeners raise on an acre, and the liberty of ploughing on one side of every row, or in the interval, and horse-hoeing between the narrowest rows, or the partitions.

" When the proper season arrives, about Old Michaelmas, or a little after, the plants are to be set, as above, first one row the length of the ground, at two feet distance from each other; and, when this is done, then another row in the same manner, at two feet distance from the last; and, when this is done, another row must be planted, in like manner, at the distance of four feet three inches from the last; then another row of plants, at two feet distance from the last: here, then, one system will consist of one partition of two feet, and an interval of four feet and a quarter, and of two plants to each system; for four feet and a quarter, added to two feet, and then multiplied by two feet, the distance of the plants in the rows, gives the parallelogram for two plants, or twelve feet and a half; and this, divided by two, gives six feet and a quarter; which is the gardeners distance, in their practice of cultivating these plants, or raising about 6970 cabbages on an acre, which is 2130 more than can be raised when they are planted in square yards throughout the acre.

" The ground being thus planted, we are now to conduct these vegetables through all the stages of their growth, and to help them to nutritive principles in the state of their greatest exigency; and, in order to this, at the beginning of winter the ground must be taken good care of, not only to keep it dry, but also to drain off the chilling wets from the bed of plants, which, as was said before, contains two feet. The first thing, then, to be done, at the approach of winter, but when the soil is dry, is to throw the intervals up into a sharp ridge, at two bouts, twice in a place, and as deep, each time, as the plough can go; this ridge-work, and double spitted, may be performed very well at two bouts, as it will allow nine inches in the middle of the interval, when the ploughman begins to turn the mould of the first bout upon; and then, at the second bout, he will reach within three inches of the plants, if he measures the ground as he ought with his plough, in leaving nine inches to turn the first furrow on, and keeps exactly nine inches, in the second bout, from the land side of the first: however, he must so manage his two bouts, as to come no nearer than three inches to the beds of plants, whilst he is going the second bout.

" This operation being over, the ground will then lie in the following form: there will be a high two-bout land in the interval, taking up five furrows in breadth, or three feet nine inches, reckoning nine inches for the breadth of the plough, as it runs in the ground; and there will be a drain, on the outside of each bed of plants, nine inches wide, and, it being double spitted, or twice in a place, near a foot deep, at least cut so with the plough, though some mould will unavoidably fall back again, notwithstanding the care the ploughman may take to prevent it: and from the edge of the land side of each drain, or the breadth of each bed of plants, there will be two feet and a half of ground, which, through the winter, will be kept very safe from too much wet, by means of those drains; which is of great consequence to the plants, as much cold moisture brings on such a condensation and contraction among the component parts of this vegetable, that all the expansive principles in the spring and summer cannot unbrace; by which a dwarf state of the plant necessarily ensues.

" About the latter end of March, or the beginning of April, if the ground be dry, the ploughman is to go once in a place in the drain, or open trench, in order to deepen it still more, and to stir the mould; and the ploughman need not be in any pain for the fibres of the roots, though he cuts or disturbs some of them in this operation: for as the fibres, which have stretched out into the bed, are undisturbed, he may cut off the outermost as near to the roots as he pleases, without doing any harm, unless he lets the plants down into the trench.

" When this operation is over, he must immediately throw down the ridge, by turning it back again, and leave an open trench in the middle of the interval, which may be done, very conveniently, at two bouts, without overthrowing the mould upon the plants; but he must remember to go twice in a place with his plough, to keep the ground double spitted, which is of great consequence to the plants, and therefore he must not think of omitting it: after this operation, the soil will have a double trench, in the middle of the intervals, the width of twice the breadth of the plough, and about twelve inches deep, if some of the earth did not fall back again; and there will be mould, the quantity of what is thrown out by the plough, in double spitting, lying between the plants and this open trench, and which will be thrown pretty near the roots of the plants; which mould is to continue there till the wants of this vegetable require us to make an alteration, when we have paid some attention to the partitions, and also to the plants themselves.

" About the middle or latter end of April, if the ground is dry, the horse-hoe must be used in the partitions, and the ploughman must go as deep with it as he possibly can, in order not only to disturb the young weeds, but also to stir the earth, in the most effectual manner, within the reach of the fibres; but, immediately before this operation, the hand-hoe is to be used in the rows, between plant and plant, to check the weeds, and refresh the mould about the roots, and the hoer must strike his instrument as deep as he can; and when the weeds, any time after this, appear above ground, in the partitions, or among the plants, the horse-hoe and hand-hoe must be used as before, but generally so timed, to be about a fortnight or three weeks after any alteration has been made in the intervals, that the fibres may have time, in either case, to heal again, instead of being disturbed all at once.

" About

" About the beginning of May the ploughman is to draw the heavy harrow, and then the finer, over the intervals, in order to pull the mould into the open trench, level, and make the whole interval fine, and to prepare it for a ploughing. These harrows, being the fame formerly mentioned, will do this bufinefs very well, without doing any harm to the plants; and if there be a good weight laid on them, they will do great execution, in pulling down the earth into the trench, and making the ground exceeding fine; which laft article is of importance, as the plough will, in future operations, turn down this fine furface to a depth where the lower horizontal fibres will meet with it, and find plenty of nourifhment therein.

" When the harrows have done their utmoft, the ploughman is to go one bout, and throw up a ridge in the middle of the interval, if the ground is dry, and to double trench, as before; and, in order to come near the plants, he may leave the breadth of about two furrows, on which to turn his bout, and then he will reach within fix or feven inches of the plants with his fhare: when this is performed throughout the ground, the harrows muft immediately be ufed as before, and then the ploughman is to turn all the mould towards the plants in two bouts, and double trenching, by which there will again be an open deep trench in the middle of the intervals: and about a month after this he is to ufe the harrows again, if the plants do not fpread too far into the intervals; if they do, he muft level the ground with his plough, or the horfe-hoe, and then go one bout, and turn the mould on the breadth of a furrow and a half, ftill going twice in a place; and then the ridge, and open furrow, on each fide, will contain about two and thirty inches, or the breadth of three furrows and a half, and he will have gone within nine inches of the ftems of the plants, which is near three inches farther off them than before.

" In this form the ground is to lie a month, unlefs the feafon be very growing, and the weeds make a bold appearance; in that cafe, it may be neceffary to difturb them fooner, by turning the ridge back again into the open trenches, and leaving the interval open in the middle, as formerly; and about Lammas, or a little before, the ploughman is to throw down the mould, into the middle open trench, and make the intervals level and fine, and this is the laft operation arifing from ploughing; the ground being now to remain, without difturbance, any farther than what enfues from the ufe of the horfe-hoe, in the intervals, after the ground is made level, as, before fummer is over, there may come up fome weeds, which muft not be fuffered to appear with impunity. It is prefumed, that due care has been taken throughout the feafon of the partitions, and between plant and plant in the rows, and likewife on the outfides near the plants, in the intervals, where the fhare and coulter could not reach without doing damage; and therefore, when the vegetables fhut out the horfe-hoe, in the partitions, or where the plough could not, or durft not, reach, the hand-hoe was to have done its office, to fupply thofe wants, in the beft manner it could.

" There is another method, which we have not mentioned, to tranfplant this vegetable on the ground it is to grow into a cabbage, which is cheaper; and it is this: thofe ploughmen, who can draw out a very ftrait furrow, fet off firft, and the perfons, who are ready with the plants, put them into the trench, fo made with the plough, at their proper diftance from each other; and when the ploughman has gone the firft bout, within the compafs of three feet and a half from the fhare point, he is to go another bout, to turn the mould into the firft open furrow, fo as not to bury the plants, in this operation; and he will have gone thefe two bouts, one to open the ground for the reception of the plants; and the other to give them mould, by the time the people have fupplied the furrows with plants, fo that they may be all ready to ftart together again when the team returns to the head land, from making his fecond bout.

The plants, on this occafion, muft be placed upright in the trench, ftanding againft the right-fide of it, which may be done if the plough cuts the ground true, and the mould be well fcooped out; and this will fhew care in the perfon that holds it, and that his inftrument is a good one. There muft be a perfon to carry a gage, divided into two feet, in each divifion, ten feet in length, which will contain fix points, the two ends, and four intermediate ones, numbered from one to fix; which divifion and points fignify, that a plant muft be placed in the open trench, directly againft one of thofe figures, as the gage lies upon the ground, when the man, who has the care of it, lays it down in a ftrait line, according to his office. In order to fhew how the plants are to be ranged, in a moft regular manner, exactly at two feet from each other, in the rows, we will fuppofe the ploughman to be juft fetting off to go his firft bout: in this cafe, the gager is to ftand with his inftrument, which may be a fquare piece of wood, of about three inches over, or twelve in the girt, and numbered 1, 2, 3, 4, 5, 6, facing the right fide of the plough when it fets off; he muft lay his right-hand juft beyond figure 4, and his left juft beyond figure 3, and, holding it in this manner, he will poife the gage very well, and lay it down, take it up, and remove it, without trouble to himfelf.

" Now, by ftanding about five feet, on the right fide, from the place where the plough enters, and two perfons with plants in their aprons, and a woman with a bafket full behind him, ftanding on the left fide, in this pofture of the people, the plough is then to move on, and when the ploughman has paffed by the end of the gage, the gager is then to lay it down, but in fuch a manner, that the end, number 1, may touch the place where the plough entered the ground, and the end, number 6, may lay in the right edge of the trench, on the mould turned out. The firft man muft fix his eye on figure 1, and, at the fame time, the fecond man on figure 4, and each of them, is to place a plant againft his own figure; and then the firft gardener puts down another at figure 2, and another at figure 3, and while he is doing this, the fecond gardener fupplies figures 5 and 6, in the very fame manner; and, when they are fupplying figures 3 and 6, the gager is to ftoop down to be inftantly ready to take up the gage, in the manner before directed, and the gardeners muft take care to keep time with each other, that there be no delay in moving after the plough, in its progreffive motion.

" The gager is inftantly to remove his inftrument, placing the left end clofe to the laft plant, and the other end as before; and the gardeners are to take care of the three figures belonging to their office, the firft man managing the three firft numbers, and the fecond the three laft. They may go on very faft in this manner, if they pleafe, and, if they are three honeft active men, no plough can out-travel them in making one bout: and in this operation it is expected of the ploughman, that he will make his horfes ftep on brifkly, which they may very well do with fuch light work; for, by the fwifter motion of the plough, there is not only lefs expence attending this culture, but the trench is better cleared of the mould, and left fquare; and the furrow is thrown fo far to the right as to be in lefs danger of falling back again, which it may otherwife do, from a creeping fluggifh motion of the plough.

" Though two active gardeners, or hufbandmen, when the latter are ufed to the nature of plants, and placing them in the ground, may get forwards as faft as the plough; yet, in order to have the plants properly put againft the figures, it may be better to have them take their time, and to proportion their work in fuch a manner, that they may finifh by the time the team is at their heels, in ending the fecond bout. The gager, and the two gardeners, need not be afraid of too much ftooping; for the gager, when he ftoops to put down his gage, has walked five feet, from the laft place where he took it up, and, in fact, is only diverfion and exercife for him; and the firft gardener, when he ftoops to put down his three plants, ftepping along at the fame time, in that pofture, has fix feet of ground to walk upright upon, which he may difpatch very nimbly, if occafion requires it; and the fecond gardener, in like manner; and as a perfon attends them at their backs with a bafket of plants, they may, without lofs of time, be fupplied, while they are walking, and take lefs or more into their aprons,

aprons, or hands, as they see convenient, and consistent with dispatch.

"When the gager gets up to the far end of the ground, he must remember to keep on the furrow side of the plough, that is, on that side towards which the mould is turned; and the ploughman is now to receive farther directions how to proceed, when he has gone the two bouts, mentioned before. He was desired to draw out a very strait furrow when he first went up the ground, by taking sight of a tree, bush, or any other mark, exactly in the middle of the ground, and directly opposite to the place where he is to set off from, and which he judges to be in the middle; or he may use any method agreeable to himself, provided a strait line be only drawn out by the plough, for on this depends the regularity of all the rest of his bouts, and the operations of horse-hoeing and ploughing during the growth of the cabbages. The first furrow being thus drawn out, the next business is, to turn the horses to the right, and then to measure three feet and a half, from the edge of the land side of the first furrow, or that edge cut with the coulter; and, making a mark at the end of three feet and a half, he must put the share point in there, and come strait back again, keeping exactly three feet and a half from the far edge of the other furrow; and then, as was said before, he must go a second bout, to turn the mould into the open furrow where the plants are placed, which he may very well do without doing them any harm: if he proportions the depth of the furrows, where the plants are put, to their size, as they will be greater or less, just as the season has been for their growth on the beds whereon they grew.

"When all this is performed, and the ploughman is ready to set off again, in order to make another bout, he is to turn to the right, to draw out another furrow, which is to receive the plants, which must stand four feet and a quarter from the row of plants now on his right-hand; to do which he is to consider, that the near edge of the open furrow next to him is the breadth of two furrows, or eighteen inches, from that row of plants; and taking eighteen inches from four feet and a quarter, the remainder is thirty-three inches; and because the plants must stand on the furrow side, therefore we must add the breadth of the plough, which is nine inches, to the above thirty-three, which then will make three feet and a half from the edge of the open furrow next to him; and now measuring three feet and a half from that furrow, he must make a mark, and go his bout, turning to the right, and making the same mark from the outermost furrow as before, and so proceeding strait back again.

"He is now to go another bout, to earth his plants, and when he has done this, he must still turn to the right, and make a halt on the head land, to consider what is next to be done: he knows the edge of the open furrow, now on his right-hand, and next to him is eighteen inches from the nearest row of plants, and that the furrow he is going to open is for the plants to stand just two feet from the last row; and therefore taking eighteen from twenty-four, the remainder is six: and because the breadth of the plough is nine, therefore he must measure fifteen inches from the edge of that open furrow next to him, and making a mark there, that is the place where he is to set off: and when he gets to the far end of the ground, he must turn to the right, and measure off fifteen inches from the edge of that open furrow next to him, as he comes down again: he is to go another bout to earth his plants, and then all things will be easy to him, as it will be only repeating what he did before; for as he is now going another bout, he is to measure three feet and a half, from the near edge of the open furrow next to him on his right-hand, and go strait up, and turning still to the right-hand, he must measure the same distance, as he comes down again from that open furrow, and when he has made another bout to earth those plants, he measures fifteen inches from the edge of that furrow; and when the plants are put into that he is now making and earthed, he then proceeds to measure off three feet and a half, which forms the interval, and so on earthing, and then measuring fifteen inches alternately with the other, for the partitions, till all is finished.

"By which operations the whole ground will be planted with two rows, at two feet the partitions, and four feet and a quarter the intervals. Thus, then, upon the whole of these directions, when he first sets off, and gets to the far end, and, turning to the right, he measures three feet and a half; when he has earthed plants, he measures three feet and a half for the next bout to receive the plants; and, earthing these, he measures fifteen inches for another row of plants; and, earthing these, he measures three feet and a half; and earthing these, he measures fifteen inches; and so on, alternately, three feet and a half, and earthing; then fifteen inches, and earthing; then three feet and a half again."

The farmer will, doubtless, be glad to know what crop he is to expect from his land after all his labour; he has already been informed, that the number of cabbages on an acre, if they have all stood to maturity, will be six thousand, nine hundred and seventy: these may be allowed to weigh, one with another upon a medium, three quarters of a stone each; and if an ox be allowed to eat nine stone a day, that is, twelve cabbages, then six oxen will live three months on one acre of them; so that supposing one acre of turnips, raised in the common method of husbandry, to be sufficient during the same space of time for two oxen, we may still expect, in proportion, three times more benefit from the cabbages than from the turnips.

Mr. Randall assures us, that the oxen will grow very fat upon such food; that he has given it to many cows for a long time together, without perceiving the least disagreeable taste, either in the milk or butter: on the contrary, the milk was rather richer and sweeter; and that both oxen and cows are exceedingly fond of this food. The same may be said of sheep, which improve in their flesh very fast, and grow surprizingly fat on cabbages; yet has the mutton no disagreeable taste; so that there is perhaps no vegetable which will raise lean sheep of the largest breed sooner than cabbages. *Randall's Semi-Virgilian Husbandry, p.* 315.

CADDOW, a name given to the jack-daw, in some of the northern counties of England.

CADMA, the least of the pigs which a sow has at one farrowing; for they have generally one which is remarkably less than the rest.

CALF, the young of a cow.

There are two ways of breeding those calves you design to rear; the one is to let them run with the dam all the year, which is the common way used in the cheap breeding countries, which they reckon makes the best cattle; and the other way is, to take them from the dams after they have sucked about a fortnight: then they teach them to drink flet or skimmed milk, which they make just warm for them, it being very dangerous to give it them too hot. The best time for weaning of calves is from January to May. Let your calves have milk for about twelve weeks; only a fortnight before you wean them from milk, let water be mixed with the milk; and after your calf hath drunk milk about a month, take some of the freshest, sweetest hay you have, and put little wisps of it into some cleft sticks, which place so as the calf may easily come at them to learn to eat; and after Lady-day, when the weather is fair, turn your calves to grass, taking them in a few nights at first, giving them milk and water, and sometimes giving the same to them in a pail in the field, till you find they are able to feed themselves, so as not to desire it: but by no means let your grass be too rank, but short and sweet, that they may get it with some labour. All wean their calves at grass; for if you wean them in the house with hay and water, it is apt to make them big-bellied, and to rot; and when you have resolved which of the males to keep for bulls, let the others be gelt for oxen, which the sooner you do the better: when they are about ten or twenty days old, is the best time, and least dangerous.

In Hertfordshire, Essex, and most places near London, they commonly fat all their calves for the butcher, because they have there a good market for them, and the lands are not so profitable to breed on as in cheaper countries; a good calf there often selling for as much as a good heifer, especially if they are very fat and white, which they take a great deal of care to make them. Their way of doing this is by keeping them clean, giving them fresh litter every day, which they lay upon their old litter; for they clear out their coops but two or three times in a year, and most commonly at a time when they have no calves in them; they constantly also let them have a large chalk-stone or two to lick, which they bore a hole through, and hang up by a string in a corner of the coop, which prevents their fouling it with dung and urine. They also observe to set their coops where they may have as little sun come to them as they can, that they be not made close and stifling, and that they stand a yard above the ground, that the urine may run from them: and to make them white, they often let them blood when they are about a month old, and a little before they kill them; and because they are often loose, they do not let them suck their fill; but instead of it they sometimes give them chalk scraped into milk, which they pour down with a horn; also salt and water, and sometimes they cold bathe them, and give them bole-armoniac and chalk, which they moisten with milk, and make it into balls, and give it them. If a cow will not let a strange calf suck her, rub both hers and the calf's nose with a little brandy. *Mortimer's Husbandry, vol. I. pag.* 228.

A young calf is left with its dam the first five or six days, that it may be kept always warm, and suck whenever it pleases: but if in those five or six days it grows and gathers strength, there is a necessity for making a separation, as he would exhaust the cow if left always with her. Sucking two or three times a day will now be sufficient. If you intend to fatten him speedily, and, at the sme time, render his flesh fine and delicate, let him have every day raw eggs, boiled milk, and the crumbs of bread: by this means the flesh, at the end of four or five weeks, will be excellent. Calves, therefore, intended for the butcher should not suck above thirty or forty days; but those designed for the dam for two months at least; as the more they suck, the stronger and larger they will prove. The best for bringing up are those calved in the months of April, May, and June. It is seldom that those which come later acquire sufficient vigour to support them during the inclemency of the following winter; the cold causing them to droop, and many of them to die. Thus calves designed for keeping should be weaned at two, three, or four months; but before taking them totally from the milk, a little good grass, or chopped hay, should be given them, that they may become accustomed to such aliment; for when they are to be entirely separated from their dam, they must never be suffered to come near her either in the stall or pasture, whither they should be sent every day, and remain there, during the summer, from morning to evening; but at the setting in of the cold weather in autumn, they must not be let out till late in the morning, and brought back early in the evening. And as the pinching cold of winter will be extremely detrimental to them, they should be kept very warm in a cow-house, and well supplied with water; saintfoin, lucern, &c. should be mixed with their common hay. They must be let out only in warm weather. A great deal of care is necessary to bring them through the first winter, which is the most dangerous period of their lives; for they will acquire so much strength during the following summer, that they will have nothing to fear from the cold of a second winter. *Buffon's Histoire Naturelle, tom.* IV.

The desire of profiting by the milk of the cow, is often the cause of the calf's being two early weaned. A month or two more, in short the time required by nature, would strengthen it in its youth; it would grow more successfully, and, in time, fetch a profit with good interest. But this is hardly done any where. No sooner is it believed that it can subsist without the mother's milk, than the farmer thinks he gains a great deal by weaning it: ill fed, and infirm, it grows at best to be a sorry bull, or feeble bullock, from which little profit, and much less service, can be expected.

Ignorance and want of reflection form the principal source of this abuse! People do not know, or do not reflect, that the vital flame, inclosed in the heart of a new-born animal, must be cherished and augmented; that it attracts and is nourished by that contained in the milk; that this vital flame, weak at first, would scarce have power to separate the auxiliary fire from the milky particles with which it is incorporated, if milk was a less delicate substance than nature hath formed it for this first service; but in proportion as the vital fire acquires force, the milk grows thick, because its grosser particles are destined for forming and consolidating the body of the animal. When the vital flame is arrived at such a degree, as to be superior to the succours which the milk can afford, nature excites the animal to seek a more solid nourishment, and then, but not before, is the time for weaning it. For, by anticipating that time, you run the risque of leaving the animal imperfect in its interior parts: the aliment which is administered being above its strength, it cannot perform a perfect digestion, and the nourishment it receives is so much the less; because, in all natural bodies, the strongest juices, and the most efficacious qualities are always mixed, and, as it were, blended with the hardest particles. Hence it happens, that a sickly animal does not derive from the same food so much nourishment as an animal in health. Indeed the vital flame, too much employed in resisting the attacks of the corrupted humours, hath not force enough to extract from the aliment the necessary auxiliary fire it contains. Besides, the food being only in part dissolved, passes away in the excrements, and forms only a thin inefficacious manure.

As therefore we may be assured, that by weaning a calf too early, it will continue infirm and of small value, so by leaving it with its mother, as long as its constitution requires, we may expect it will become strong and vigorous; and by following this method, we can hardly fail of raising a breed of cattle, that will redound both to the honour and profit of the farmer.

Young calves are apt to be attacked by insects, which disturb and torment them, and, at the same time, prevent their fattening. In order to preserve them from these insects, and even cure them when they are attacked, it will be proper to prepare an ointment of melted hogs-lard and quicksilver, well rubbed together in a marble or iron mortar. Spread this ointment upon a linen cloth, which wrap up in three folds, and stitch it for a collar to the calves. It will not only cure them, but also disperse the insects.

There is no better nourishment for young calves, than vetches soaked in water till they swell; but observe to steep no more than will serve them for once; because when they continue moist for any considerable time, they are apt to grow sour, and would then do them more harm than good. *Journal Oeconomique.*

CALKINS, a name given in some parts to a sort of horses shoes, made for frosty weather.

These shoes, by forcing the horse to tread wholly on the toes of his hind feet, are apt to occasion bleymes, and ruin the back sinews. The farrier, therefore, should be ordered to pare the horn a little low at the heel, and turn down the sponge upon the corner of the anvil, so as to make the calkin resemble the point of a hare's ear, which will remove the consequences often attending the common square calkin.

CALTHA, the marsh marygold, the name of a perennial plant, growing naturally in the low meadows, in many parts of England.

M. du Hamel recommends this plant to the notice of farmers, as very useful to be cultivated as a winter pasture for cattle; and experience has justified his recommendation. Perhaps it might prove as useful in this country as in France, especially as cattle are known to be extremely fond of it, and the plant might be easily cultivated.

CAMMOCK, the name of a troublesome plant infesting arable lands; but more generally known by the name of rest-harrow. *See the article* REST-HARROW.

CANARY-*seed*, the name of a small seed produced by a gramineous plant, cultivated in some parts of England.

A correspondent of the editors of the Museum Rusticum, has given us the method practised by the farmers of the island of Thanet, in the culture of canary-seed. He observes, that they generally chuse to sow it in fresh land; that is, fuch as has only borne grafs. After ploughing up the lay, and bringing the land into tolerable rough tilth, they fow it with peas; thefe are kept clean hoed as ufual, and yield a good crop. The next year the land is well ploughed, and planted with horfe-beans, which thrive well in that ifland. Thefe two crops effectually kill the greenfward, or grafs; take off the ranknefs of the foil; and the frequent hoeings, which are neceffary to keep the weeds under, bring the land into fine tilth. After the beans are off, a thorough ploughing is given to the land, and in that condition it remains till the fpring: about the beginning of March, if the weather be fine, and the feafon dry, the land is ploughed for the laft time; immediately after which the canary-feed is fown.

The farmers in that ifland ufed formerly to fow canary-feed with a broad caft, fpreading it all over the land; but when this was the practice, they found it very difficult to hoe and keep the plants clean from weeds: at prefent they fow it in furrows, made a-crofs the land, conftantly taking care to make the ridges between the furrows as fharp as poffible: by this means the feed, which is fown by hand, flips from the fides and tops of the ridges into the furrows, and the plants come up in regular rows. The plants muft be kept very clear of weeds by means of the hoe, weeding-hook, &c. and if it be a wet fummer, the intervals muft be hoed feveral times; but of this the intelligent farmer is the beft judge.

Three pecks of feed are, in general, enough to fow an acre, fometimes more, and often lefs. The canary-feed feldom comes on till the wheat harveft is entirely over, and the corn houfed: but it muft be obferved, that the wheat harveft is generally very early in that ifland. It is reaped with a hook, and as faft as it is cut, the reapers lay it on the land in wads, as they call them, or parcels about the quantity of half a fheaf of wheat unbound: in this manner, if the weather be favourable, it is left near a fortnight, at the end of which time, the wads muft be turned, that the other fide may be dried. If the weather be very wet, they muft be turned oftener, to prevent the feed from fprouting.

The price of reaping canary in that ifland is from fix to eleven fhillings per acre; and the price of threfhing and dreffing it is five or fix fhillings a quarter. According to the goodnefs of the land, and the tillage that has been beftowed upon it, the farmers there expect their return to be from twenty-five to fifty bufhels per acre; but the common crop is from thirty to thirty-four. It muft, however, be obferved that the farmers never pay fo much as ten or eleven fhillings per acre for reaping this crop, unlefs the canary be very much lodged and tangled, which it often is, owing to the land in which it grows being frefh, rich, and rank, and to the high winds to which that ifland is fubject.

They fow fucceffive crops on the fame land for eight or ten years; and fowing canary would be a very great improvement to lands which lie convenient for water carriage to London markets, was it not a crop the farmer ought by no means to depend upon, not only becaufe the return, or quantity it yields, varies greatly, but alfo on account of the fluctuation in the price of this feed in the London markets, where the greateft and indeed almoft the whole demand is. *Mufeum Ruft. vol.* I. *p.* 22.

CANKER, a fmall fpeck made by a fharp humour, which gnaws the flefh almoft like a cauftic.

This diftemper often attacks the foot of a horfe, and generally proceeds from thrufhes, when they prove rotten and putrid, though many other caufes may produce this diforder. The method ufed by farriers for the cure is generally with hot oils, fuch as vitriol, aqua fortis, and butter of antimony, which are very proper to keep down the rifing flefh, and fhould be ufed daily till the fungus is fuppreffed, when once in two days will be fufficient, ftrewing red precipitate powder over the new grown flefh, till the fole begins to grow.

There is one great error committed often in this cure, which is, in not having fufficient regard to the hoof; for it fhould not only be cut off, wherever it preffes upon the tender parts, but fhould be kept foft with linfeed oil; and as often as it is dreffed, bathe the hoof, all round the coronet, with chamberlye. Purging is very proper to complete the cure. *Bartlet's Farriery, p.* 314.

CANKER, in trees, implies a wound or blemifh in the trunk, which does not heal up naturally, but will increafe and damage, if not endanger, the whole tree.

The canker in fruit trees is moft commonly occafioned by wet, which gets in at the cleft where the tree was grafted, or at fome other wound which has been neglected: but it alfo proceeds fometimes from the foils not agreeing with the nature of the tree.

If this diftemper be only fuperficial, arifing from a bruife, for example, which the bark may have received, it may be cured by cutting the injured part out with a fharp knife, and then binding over it a mixture of cow-dung and earth, tied on with a wifp of hay, likewife daubed with cow-dung. This muft be done before the fap begins to rife; for otherwife the bark will peel, loofen, and wither much farther than the bruife, to the great hazard of the whole tree, efpecially if the ftem be the part affected; for as to a bruifed branch, the beft way is to lop it off at once, if there be the leaft fufpicion of danger. But when the canker has been bred in the tree, or when it has extended from the trunk to the branches, or from the branches to the trunk, fo that after cutting away to the very quick, there ftill remains an eye, or fpeck, like that which is fometimes feen to run through a whole plant of diftempered corn, the fhorteft way is, to commit the tree to the fire, and to plant another in its ftead. Mr. Nourfe is indeed inclined to think that, if the canker has not penetrated too far the tree or ftock, fuppofing it to be of the apple kind, it may poffibly be faved, by regrafting it with a winter quinnin, a boderan crab, a boon apple, or a golden pippen; neither of which he had obferved ever to canker: but how accurate his obfervations may have been in that refpect, we fhall not pretend to determine. Certainly it may be worth while to try a change of fruit in all fuch cafes, if they are not abfolutely defperate. He afferts, upon his own experience, that the apple which we call a woodcock, is no way apt to canker, or to be blafted.

This, if it be fact, renders it by fo much the more worthy of cultivation, as it is a great and conftant bearer, and yields an excellent juice. The misfortune is here, as well as in the attempts which have been made to fuit the foil and the fruit, that each of thefe is diftinguifhed, either by fuch general appellations and defcriptions as ferve only to puzzle the hufbandman when he comes to real practice, or by names which are not known out of the places where they are ufed. Doctor Cullen will render a great fervice to mankind, if he fhould happily fucceed in that important point, which, if we are rightly informed, is the object of his prefent ftudies; viz. to afcertain by an exact analyfis, which no one can be better qualified to do with the utmoft precifion, what are the component particles of each different fpecies of foil, and what proportion they bear to each other. This, divefted of that parade of fcience, and of fcientific terms, which the learned are too apt to difplay, and which ferves only to embarrafs common underftandings, will, fhould fuch a work appear, as it is hoped that it will foon, anfwer a very effential purpofe in agriculture, as well as lay a fine foundation for ufeful entertainment to gentlemen whofe leifure permits them to profecute fuch ftudies. But the tafk, confidered in all its various branches, is arduous indeed! worthy of that able phyfician, we ufe the word here in its moft extenfive and moft proper meaning, and fkilful chemift, whofe love for the welfare of mankind has prompted him to undertake it.

Mr. Worlidge affures us, that he himfelf cured a tree defperately difeafed with the canker, by cutting off as many as he could of the cankered boughs, laying its roots bare during all the winter, and applying to them in the fpring a great quantity of fwines dung, not too new, mixed with the earth, which was then returned into its former hole. If this does not do, he condemns the tree to be grubbed up, as being paft recovery. *Nourfe's Difcourfe on the Benefits and Improvements of Hufbandry, pag.* 138. *Worlidge's Syftema Agriculturæ, cap.* viii. *fect.* ii.

CAPELLETS, in horſes, are particular ſwellings which thoſe animals are ſubject to, of a wenny nature, which grow on the heel of the hock, and on the point of the elbow: they ariſe from bruiſes and other accidents, and when this is the caſe, ſhould be treated with vinegar and other repellers; but when they grow gradually on both heels or elbows, we may then ſuſpect the blood and juices to be in fault; that ſome of the veſſels are broke, and the juices extravaſated. In this caſe the ſuppuration ſhould be promoted, by rubbing the part with marſhmallow ointment; and when matter is formed the ſkin ſhould be opened with a lancet, in ſome dependent part towards one ſide, to avoid a ſcar: the dreſſings may be turpentine, honey, and tincture of myrrh. The relaxed ſkin may be bathed with equal parts of ſpirit of wine and vinegar; to which an eighth part of oil of vitriol may be added. The contents of theſe tumours are various, ſometimes watery, at others ſuety, or like thick paſte; which if care be not taken to digeſt out properly with the bag, will frequently collect again: was it not for the disfigurement, the ſhorteſt method would be to extirpate them with a knife, which, if artfully executed, and the ſkin properly preſerved, would leave very little deformity.

When thoſe tumours proceed from an indiſpoſition of the blood, they are beſt let alone, eſpecially thoſe of the watry kind, which will often wear off inſenſibly, without any applications: but when they are like to prove tedious, you ſhould endeavour to diſperſe them by bathing the parts with repellers, and have recourſe to rowels, purges, and diuretic medicines, to carry off the ſuperfluous juices and correct the blood. *Bartlet's Farriery, p.* 277.

CAPO, a word uſed in Cheſhire, to ſignify a working horſe.

CAPON, a cock chicken gelded as ſoon as left by the hen, or at leaſt as ſoon as he begins to crow.

Capons are very uſeful to lead chickens, ducklings, young turkeys, pheaſants, and partridges, which they will do better than the hen, and at the ſame time make a ſtouter defence againſt kites and buzzards. The largeneſs of their body is alſo of great advantage, as they will cover between thirty and forty of them.

CARAWAY-SEED, the ſeed of a plant growing wild in ſome rich meadows in Lincolnſhire and Yorkſhire; and is ſometimes found growing in the paſtures near London. It is alſo cultivated for uſe in Eſſex, and ſome other counties.

It is a biennial plant, which riſes from ſeeds one year, flowers the next, and periſhes ſoon after the ſeeds are ripe. It has a taper root like a parſnep, but much ſmaller, which runs deep into the ground, and hath a ſtrong aromatic taſte, ſending out many ſmall fibres; from the root ariſes one or two ſmooth, ſolid, channelled ſtalks, about two feet high, garniſhed with winged leaves, having long, naked foot-ſtalks. The ſtalks divide upward into ſeveral ſmaller branches, each of which is terminated by an umbel, compoſed of ſix or eight ſmall ſeparate umbels, ſuſtaining ſingle white flowers, with heart-ſhaped petals; the flowers of thoſe ſmall umbels are cloſely joined together. After the flowers are decayed, the germen becomes an oblong channelled fruit, compoſed of two oblong channelled ſeeds.

The beſt ſeaſon for ſowing the ſeeds of this plant is in autumn, ſoon after they are ripe, when they will more certainly grow, than thoſe ſown in the ſpring; and the plants which riſe in the autumn generally flower the following ſpring, ſo that a ſummer's growth is hereby ſaved. *Millar's Gard. Dict.*

Caraway-ſeeds delight in a dry mould, ſomething inclining to clay, or rich garden mould. Eight pounds will ſow an acre. *Mortimer's Huſb. vol.* I. *p.* 201.

CARBERRY, a name given in ſome parts of England to the gooſeberry.

CARCASE, a name generally given to the body of a horſe.

The carcaſe of a horſe ought not to be too ſmall and ſlender; for a ſmall carcaſed horſe is generally weak. On the other hand, a very large carcaſed horſe proves often heavy and unactive, and when he happens to be underlimbed, it is reckoned a great fault, though this remark often fails, and horſes, that have been reckoned very much underlimbed, have proved as ſtrong, and fully as ſerviceable as any other.

A low back is another fault that almoſt every body complains of, and indicates weakneſs, though a moderate ſinking below the withers is not at all amiſs, if the back be otherwiſe ſtrait. When this ſinking is not great, the forehand generally riſes well. But when a horſe has a low back, and is higher behind than before, it is not only ugly, but ſuch horſes are generally weak, are apt to be pinched in their ſhoulders, and have an aukward way of going, owing to the heavineſs of their hind parts, which hinders them from getting on.

Some are fond of horſes which are home ribed, which is indeed a property that denotes both beauty and ſtrength, as thoſe that are open ribed are looked upon to be weak and looſe; but in ſome horſes the ſhort ribs approach ſo near the haunches, that they have ſcarce liberty to breathe, and ſuch horſes are the moſt out of wind of any other when put upon hard exerciſe, and eaſily go broken winded. But a horſe that is open and looſe in his flanks, like a grey-hound, is liable to many diſadvantages, which it would be tedious here to relate; ſuch are always narrow over the chine, have little or no belly but what is forced by art and feeding; and though we find ſome of this kind more vigorous than others, and even exceed all expectation, yet the generality of ſuch horſes are ſeldom fit to carry a great weight, or to hold out in hard riding. Some are great admirers of ſhort backed horſes, which is a right way of judging, ſo far as this ſtands in oppoſition to a very long back. But ſome horſes are ſo very ſhort, notwithſtanding they are otherwiſe of a good ſize, that they ſeem to be loſt under common furniture. But when a tall horſe happens to have a ſhort carcaſe, and very long legs, like a ſpider, ſuch a horſe is ſeldom good for much. If a horſe's back be ſhort, his whole body and limbs ought to be ſhort, and then it denotes ſtrength and firmneſs; but moſt of theſe make but a ſlow progreſs on a journey, though they will endure and hold out as long as any other, unleſs they are urged on with horſes of greater ſpeed.

It always denotes ſtrength in a horſe, when his carcaſe is of a moderate ſize, his ribs large, his flanks not hollow but ſmooth and full, with a ſtrait back, or but a very little ſinking, his hinder parts, or uppermoſt haunches not riſing higher than his ſhoulders. *Gibſon on horſes, vol.* I. *p.* 31.

CARDOON, a kind of wild artichoke, propagated only by its ſeed, which is if an oval form, about as big as a grain of wheat, of a very dark green, or blackiſh colour, and marked with black ſtreaks from one end to the other. There are two ſeaſons for ſowing it: the firſt is from the middle to the end of April; and the other about a month later. The ſoil ſhould be rich, deep, and fine. In a bed of ſuch mould, four or five feet wide, two trenches ſhould be opened, a foot wide, ſix inches deep, and at leaſt three feet aſunder: or, to anſwer the ſame intention, the rows of holes of the ſame depth ſhould be dug ſtrait by a line ſtretched along the bed. Theſe holes ſhould be three feet aſunder, and in quincunx order; or, if a trench is uſed, the quincunx form ſhould be obſerved in ſowing the ſeeds, which is performed in the following manner. Five or ſix of the ſeeds are dropped nearly together, at the diſtances before mentioned, and then covered over: not with a deſign to let ſo many plants grow cloſe together in a thick cluſter; but, as the growth of theſe ſeeds is ſomewhat precarious, to be the more certain of having two or three plants at each ſtated diſtance: for if all of them come up, they are immediately thinned to that number; and if they miſcarry entirely in any one ſpot, the chaſm is filled up with plants taken from another place, generally a hot-bed, on which ſome of theſe ſeeds are moſt commonly ſown when its heat is expiring, for a recruit in a caſe of need. The firſt ſowing will generally come up in three weeks, and the latter in about fifteen days. Great care muſt be taken to keep thoſe plants clear from weeds, and to water them frequently, in order to make them increaſe in bulk, and not run to ſeed. But this intention will doubtleſs be much better anſwered in every reſpect by a judicious application of the principles of the new husbandry; we mean, by deep and frequent ſtirring of the ground on each ſide of the bed, letting the ſhare or ſpade approach to within a very few inches of the plants.

Towards the latter end of October, the cardoons thus cultivated will be fit for tying up, in order to be blanched. In order to this a dry day ſhould be choſen, when all the leaves of each cluſter being collected cloſe together, wiſps of ſtraw, or long litter, ſhould be twiſted round them ſo as to prevent the acceſs of the air to any part of them, except their very top, which ſhould be left open. In a fortnight or three weeks the plants thus covered will become white and fit to eat.

This tying up, and blanching of cardoons, may be continued till the winter approaches, and then thoſe who are ſo fond of them as to think it worth their while to be at the trouble, may take them up, with ſome earth about their roots, and remove them into a green-houſe, if they have one, or into a cellar, and by that means keep them for uſe all the winter. Some of theſe may be replanted in the ſpring, in an open border, as before, to feed in June or July; or they may be cut down to the ground, when hus planted anew, and their ſecond year's ſhoots may be ied up and whitened as before.

Beſides the uſe which the Italians, French, and Spaniards, make of this cardoon, in eating it raw with pepper, ſalt, oil, and vinegar, many think it preferable to celery, when ſtewed, becauſe it is mellower, and much more tender.

CARLICK, the ſame with charlock. *See the article* Charlock.

CARPET-WAY, a green-way, or path left in an arable field, without being ploughed.

CANE, a hollow place where water ſtands. It alſo implies a wood of alder, or other aquatic trees in a moiſt boggy place.

CARRIAGE, a general name for carts, waggons, and other vehicles, employed in carrying timber, corn, perſons, &c. from one place to another.

Carriage, alſo ſignifies a furrow, or trench, for conveying of water to overflow and improve meadow-land. It is diſtinguiſhed into two ſorts; the main carriage, which ſhould be made with a convenient deſcent; and the leſſer carriages, which ſhould be ſhallow, and as many in number as poſſible.

CARROT, the name of a root, too well known to need any deſcription here.

Carrots are propagated at two or three different ſeaſons, or ſometimes oftner, where people are fond of young carrots through all the ſummer months. The firſt ſeaſon for ſowing the ſeeds is ſoon after Chriſtmas, if the weather is open, which ſhould be in warm borders, under walls, pales, or hedges: but they ſhould not be ſown immediately cloſe thereto; but a border of lettuce, or other young ſallad-herbs, of about a foot wide, ſhould be next the wall, for otherwiſe they would run up to feed, without making any tolerable roots.

They delight in a warm, light, ſandy ſoil, which ſhould be dug pretty deep, that the roots may the better run down; for if they meet with any obſtruction, they are very apt to grow forked, and ſhoot out lateral roots, eſpecially when the ground is too much dunged the ſame year that the feeds are ſown, before it be conſumed, and mixed with the earth.

Theſe feeds have a great quantity of ſmall forked hairs, by which they cloſely adhere, ſo that they are difficult to ſow even, ſo as not to come up in patches; you ſhould therefore rub it well through both hands, whereby the feed will be ſeparated before it is ſown: then you ſhould chuſe a calm day to ſow it; for if the wind blows, it will be impoſſible to ſow it equal; for the ſeeds, being very light, will be blown into heaps. When the feed is ſown, you ſhould tread the ground pretty cloſe with your feet, that it may be buried, and then rake the ground level.

When the plants are come up, you ſhould hoe the ground with a ſmall hoe about three inches wide, cutting down all young weeds, and ſeparating the plants to four inches diſtance each way, that they may get ſtrength; and in about three weeks after, when the weeds begin to grow again, you ſhould hoe the ground over again a ſecond time, in which you ſhould be careful not to leave two carrots cloſe to each other, as alſo to ſeparate them to a greater diſtance, cutting down all weeds, and ſlightly ſtirring the ſurface of the ground in every place, the better to prevent young weeds from ſpringing, as alſo to facilitate the growth of the young carrots.

In about three weeks or a month after, you moſt hoe them a third time, when you muſt clear the weeds as before; and now you ſhould cut out the carrots to the diſtance they are to remain, which muſt be proportioned to the ſize you intend to have them grow: if they are to be drawn while young, five or ſix inches aſunder will be ſufficient; but if they are to grow large before they are pulled up, they ſhould be left eight or ten inches diſtant every way: you muſt alſo keep them clear from weeds, which, if ſuffered to grow amongſt the carrots, will greatly prejudice them.

The ſecond ſeaſon for ſowing the ſeeds is in February, on warm banks ſituated near the ſhelter of a wall, pale, or hedge; but thoſe which are intended for the open large quarters, ſhould not be ſown before the beginning of March, nor ſhould you ſow later then the end of the ſame month; for thoſe which are ſown in April or May will run up to feed before their roots have any bulk, eſpecially if the weather ſhould prove hot and dry.

In July you may ſow again for an autumnal crop; and in the end of Auguſt you may ſow ſome to ſtand the winter; by which method you will have early carrots in March, before the ſpring ſowing will be fit to draw; but theſe are ſeldom ſo well taſted, and are often very tough and ſticky. Many people mix ſeveral other ſorts of feeds, as leek, onion, parſnip, radiſh, &c. amongſt their carrots; and others plant beans, &c. but, in my opinion, neither of theſe methods are good; for if there is a full crop of any of theſe plants, there can be no room for any thing elſe amongſt them; ſo that what is got by one is loſt by the other; and, beſides, it is not only more ſightly, but better, for the plants of each kind to be ſown ſeparate; and alſo by this means your ground will be clear when the crop is gone, to ſow or plant any thing elſe; but when three or four kinds are mixed together, the ground is ſeldom at liberty before the ſucceeding ſpring: beſides, where beans, or any other tall growing plants, are planted amongſt the carrots, it is apt to make them grow more in top than root; ſo that they will not be half ſo large as if ſown ſingly without any other plants amongſt them.

But in order to preſerve your carrots for uſe all the winter and ſpring, you ſhould, about the beginning of November, when the green leaves are decayed, dig them up, and lay them in ſand in a dry place, where the froſt cannot come to them, taking them out from time to time, as you have occaſion for them, reſerving ſome of the longeſt and ſtraighteſt roots for feed, if you intend to ſave any; which roots ſhould be planted in the middle of February, in a light ſoil, about a foot aſunder each way, obſerving to keep the ground clear from weeds; and about the middle of Auguſt, when you find the feeds are ripe, you muſt cut it of, and carry it to a dry place, where it ſhould be expoſed to the ſun and air for ſeveral days to dry: then you may beat out the feeds, and put it up in bags, keeping it in a dry place till you uſe it. This feed is ſeldom eſteemed very good after the firſt or ſecond year at moſt; but new feed is always preferred; nor will it grow when it is more than two years old.

The Flemings have long known the advantage of feeding their cattle with carrots; though it is but of late years that this root has been cultivated for that purpoſe in the fields in England; nor does this uſeful and profitable practice extend even now to more than a few parts of this country; though there is ſcarce any root yet known, which is more heartening food for moſt ſorts of animals, or which better merits the huſbandman's attention; as one acre of carrots, well planted, will fatten a greater number of ſheep, or bullocks, than three acres of turnips, and at the ſame time their fleſh will be firmer, and better taſted. Horſes are extremely fond of this food, and there is not any better for hogs. Theſe roots have alſo been of ſuch excellent ſervice to deer, in parks, that when numbers of theſe valuable creatures have periſhed elſewhere,

where, through want in very hard winters, when there has been an extreme ſcarcity of their uſual food; thoſe that have been fed with carrots have kept their fleſh all the winter, and, upon the growth of the graſs in the ſpring, have been fat early in the ſeaſon. This is not an inconſiderable advantage, in places where the graſs is generally backward in its growth.

This plant has alſo a very great ſuperiority over turnips; namely, that the crop is not ſo liable to fail: for as the carrots are ſown in the ſpring, the plants generally come up well; and unleſs the months of June and July prove very bad, there is no danger of their ſucceeding: whereas turnips are frequently deſtroyed by the fly at their firſt coming up; and in dry autumns they are attacked by the caterpillars, which lay waſte whole fields in a ſhort time. But carrots are not preyed upon by either of theſe vermin. Every farmer who has a ſtock of cattle or ſheep, ſhould therefore always have good ſtore of theſe roots, if he has land proper for the purpoſe, which muſt be light, and of a proper depth, to admit the roots running down.

In preparing of the land for carrots in the open field, if it has not been in the tillage before, it ſhould be ploughed early in autumn, and then ploughed acroſs again before winter, laying it up in ridges to mellow by the froſt; and if the ground is poor, ſome rotten dung ſhould be ſpread over it in winter, which ſhould be ploughed in before the end of January; then in March, the ground ſhould be ploughed again to receive the ſeeds; in the doing of which ſome farmers have two ploughs, one following the other in the ſame furrow, ſo that the ground is looſened a foot and a half deep, or more; others have men with ſpades following the plough in the furrows, turning up a ſpit of earth from the bottom, which they lay upon the top, levelling it ſmooth, and breaking the clods; the latter method is attended with a little more expence, but is much preferable to the firſt; becauſe in this way the clods are more broken, and the ſurface of the ground is laid much evener.

If the land has been in tillage before, it will require but three ploughings: the firſt juſt before winter, when it ſhould be laid in high ridges for the reaſons above given; the ſecond croſs ploughing ſhould be in January, after which, if it be well harrowed to break the clods, it will be of great ſervice: the laſt time muſt be in March to receive the ſeeds; this ſhould be performed in the manner already mentioned: after this third ploughing, if there remain great clods of earth unbroken, it will be proper to harrow it well before the ſeeds are ſown. One pound and a half of ſeed will be ſufficient for an acre of land; but as they are apt to adhere togegether, they are more difficult to ſow than moſt other ſeeds; ſome therefore mix a quantity of dry ſand with their ſeeds, rubbing them well together, ſo as to ſeparate the carrots from one another, which is a good method. After the ſeeds are ſown they muſt be gently harrowed in to bury them; and when the plants come up they ſhould be hoed in the manner above directed, with this caution, to leave the plants at a greater diſtance. *Miller's Gard Dict.*

The ingenious M. Chateauvieux tells us, that having cultivated ſome carrots in the open field, according to the principles of the new huſbandry, found, when they were taken up, which was done on the 8th of November, that they were from eighteen to twenty, and ſome twenty-five inches long, and from two and a half to three and a half, and ſome four inches in diameter, and weighed from twenty-five, to thirty-three ounces each.

The Society for the Encouragement of Arts, &c. being perſuaded that the cultivation of carrots for the food of cattle could not fail of being advantageous to the farmer, publiſhed a premium of twenty pounds to the perſon who ſhould ſow the greateſt number of acres with carrots, for the feeding of cattle only; adding, that it was expected the perſon who received the premium ſhould give an account of the ſoil, culture, time of taking up, and their effects on the cattle fed with them.

This premium was accordingly given in the year 1766 to Mr. Robert Billing, a very intelligent farmer at Weaſenham in Norfolk; he having ſowed thirty acres and two rods of land with carrots, for feeding cattle only. At the ſame time he ſent an account of the methods he uſed in the culture of his carrots, which was ſo well approved of by the Society, that it was publiſhed at their requeſt: an abſtract therefore of this pamphlet muſt, we preſume, be very acceptable to the reader.

Mr. Billing obſerves, that the uſe of carrots for the winter feed of cattle has been long known and practiſed in the eaſtern parts of Suffolk, where it is common to make carrots ſerve the ſame purpoſe turnips have many years done in moſt parts of the county of Norfolk; beſides, that many are ſent from thence to the London market: but carrots never have been ſown in the latter county, for the maintenance of cattle, till he tried a ſmall parcel in the year 1761, and another in the year 1762.

He thought it prudent, he ſays, to make thoſe trials before he became a candidate for the premium offered by the Society; the hopes of deſerving which encouraged him to venture a pretty large and unuſual expence, as well as the loſs of a great part of his winter crop, and which has thus become the means of making known, in his part of the country, a ſpecies of huſbandry with which they had before no acquaintance but by hearſay, being above fifty miles from the country where it had before prevailed.

In the year 1763, he ſowed thirty acres and an half by menſuration.

This quantity of land lying in three parcels, one, of thirteen acres, bore wheat in the year 1762; one, of half an acre only, had borne clover; and the laſt, of ſeventeen acres, turnips that year. The piece of thirteen acres is a cold loamy ſoil, ſhallow, and upon a ſort of loamy gravel. The half acre is a ſoil much mixed, upon a moiſt clay. The ſeventeen acres may be divided into two parts, the one of fourteen acres, and the other of three. Both are a light and dry ſoil, newly improved with a marle; the former, an exceeding good tempered ſoil, upon a marle; the other, a ſhallow black ſand, upon a kind of imperfect grit-ſtone, called, in Norfolk, a carr-ſtone.

Previous to giving an account of the ſucceſs of his crop of carrots, and of the uſe he made of them in feeding cattle, he deſcribes the manner in which he cultivated theſe ſeveral pieces of land, founded as well upon the beſt information he was able to procure, as upon the obſervation afforded him by his own experience of the former year.

The wheat and clover ſtubble he ſplit down with the plough early in the preceding November, and is ſatisfied, from all the obſervations he has made ſince he firſt begun the cultivation, that whether the wheat ſtubble be, as it is called in Norfolk, flat work, or in ridges, or the carrots are to be ſown after clover or rye-graſs, the land cannot be ploughed too early; ſo that the froſt and ſnow may have their full effect in mellowing the ground for the reception of ſo ſmall a ſeed; and this is the more neceſſary to be attended to, the ſtiffer and tougher the ſoil ſhall chance to be.

The land that had been turnips he let alone till the end of January, or beginning of February, thinking this time enough, becauſe the earth was thoroughly cleaned by the cultivation and ſummer hoeing neceſſary for the crop of turnips.

Of the thirteen acres of wheat ſtubble, ſix were dunged for wheat, but not for carrots; four and a half not dunged at all; and two and a half for the carrot crop only. The clover land was dunged for the carrots: and of the ſeventeen acres that had been turnips in 1762, part had been tathed for the turnips, that is, where ſheep have been folded; and the whole crop of turnips was fed off by ſheep and neat cattle.

Four pounds of ſeed on an acre is ſufficient: but as the ſeed is very ſmall, light, and hard to ſeparate and diſperſe equally on the ground, he was at firſt a good deal puzzled how to overcome this difficulty; and though he was adviſed to make uſe of a mixture of ſand, he did not find it anſwer, becauſe the weight of the ſand carried it all to the bottom of the ſeed-cot: he ſows it therefore now unmixed, as they do turnips, after having forced it through a fine chaff-ſieve by rubbing.

It

It will be three weeks, after sowing, and sometimes longer, before the carrots appear: this is the principal advantage, besides the difference of expence, that turnips have over them, for the latter are not sown till about Midsummer, and coming quicker to the hoe, get the better of the weeds more easily; for weeds do not grow near so fast about Midsummer, as in the spring.

The carrots lying a longer time before they come up, and continuing afterwards a long time very weak, they are seven or eight weeks before they are fit for the hoe, and in the mean time afford the weeds an opportunity to get strength, in a season too, when unluckily they grow the fastest: Mr. Billing is therefore of opinion, that though it is necessary to sow carrots before turnips, it is better to sow them as late as you can with safety to the crop; for of his, those sown in April on the clover stubble came much the soonest to the hoe, though later sown.

The wheat and clover stubble were ploughed three times; the piece after turnips but twice; the first time shallow, the second as deep as the staple of the ground would permit; and on this ploughing the carrots were sown.

As it would remove some of the objections to a carrot crop, and lighten much the expence of weeding, could they be sown later; and as this might be done could the seed be made to come up sooner, this sensible farmer imagines the seed might be steeped in somewhat that would forward its vegetation, and afterwards sown, when dry enough to separate.

Yet however expensive the strength of the weeds in a crop of carrots makes the hoeing of them, the crop itself is not apt to suffer, for though the young carrots are quite covered in a thicket of weeds before hoeing, and should be buried in earth after the hoeing; yet they seem no way hurt if they get clear again, as they generally do in a fortnight after, if not cut off, or buried too deep, for want of skill in the labourer.

The Norfolk hoe is six inches wide. If the carrots chance to be tolerably clean, they may be hoed the first time for eight shillings per acre; but if the ground be full of weeds, occasioned either by much rain, the foulness of the ground before sowing, or the length of the time between the sowing and hoeing, the first hoeing will amount to ten or twelve shillings per acre.

About ten days or a fortnight after hoeing, they should be harrowed: this will displace the weeds, and prevent their growing again, which many of them will otherwise probably do, especially if it be showery weather: the harrowing does not hurt the carrot plants, but, on the contrary, does them much service, by bringing fresh earth to them, as well as killing the weeds.

About three weeks after the harrowing, in case it has not perfectly cleared the ground of weeds, or in case new weeds come up, Mr. Billing hoes the carrots a second time, which costs about four or five shillings per acre, as the ground is more or less foul; and after this, if there still remain any weeds, which will be the case if much rain falls during the time of the second hoeing, a second harrowing is bestowed.

Where the weather has been favourable, and those employed in hoeing have done their duty, the carrots once hoed and harrowed have been as clean as those on which two hoeings, and as many harrowings have been bestowed.

Mr. Billing next proceeds to inform us of the success he had in the year 1763, on the several parcels of ground already described. His carrots proved best on the piece of two acres and a half that had been wheat, not dunged for the crop of wheat, but dunged for the crop of carrots, and on the half acre clover stubble dunged for the carrots.

Many of the carrots out of both pieces measured two feet in length, those on the former from twelve to fourteen inches in circumference at the upper end, and those of the latter from twelve to sixteen; a difference of bulk owing, perhaps, both to the difference of soil, and the effect of former crops.

On the two acres and a half Mr. Billing computes he had from twenty-two to twenty-four loads per acre, and about fifty-five, or fifty-six cart loads on the whole: the half acre on clover stubble produced about twelve loads; the six acres and a half dunged for wheat, but not for carrots, produced from eighteen to twenty cart-loads per acre, and in the whole about one hundred and four loads; the four acres not dunged for either wheat or carrots, produced from twelve to fourteen loads per acre, and in the whole fifty-two loads.

He had but an indifferent crop of turnips the succeeding year, on the seventeen acre piece, but had from sixteen to eighteen cart-loads per acre of carrots on fourteen acres of it, but a very poor crop on the three remaining acres; so that he computes he might have on the seventeen acres after turnips not quite two hundred and seventy loads, which make, with the former, about five hundred and ten loads of carrots, equal in use and effect to near one thousand loads of turnips, or three hundred loads of hay, as experience has convinced him from the various methods in which he had tried them.

Mr. Billing thinks it is not improbable that he might besides lose five or six loads, which the poor people took, instead of a single load they might have stole, had the land been cropped with turnips; but this loss will be evidently much lightened, should the growth of carrots become general in the country.

The best method of drawing the carrots is with a four tined fork, with which a man breaks the ground six or eight inches deep, very carefully without injuring the carrots; and is followed by a little boy, who gathers the carrots, and throws them in heaps.

Our farmer began to draw his carrots for use about three weeks after Michaelmas; but as the cattle he intended to feed on them had never been used to so hard food, he thought it best to give them, at the same time, both cabbages and carrots, lest they should suffer by a distaste at the beginning.

He had about forty load of cabbages growing on one half acre, equal in use, as appeared on trial, to about seventeen or eighteen loads of carrots. He observed, that cattle of every sort naturally eat the cabbages as readily as they would have done turnips; and soon after having gradually learnt to eat carrots, began to prefer them. Both the cabbages and carrots, and afterwards the latter with turnips, were brought from a place where they grew, to a pasture close; and, without any other preparation than shaking off the dirt, they were dispersed on the ground for the cattle to feed on promiscuously.

From the experience Mr. Billing has had in fattening cattle on turnips in houses or stalls, he is persuaded that by this means the carrots might have been made to go a great deal further; but besides the great trouble attending this method, especially if the number of beasts be great, and the hazard of beasts foundering in the way to London, an accident that often happens to stall fed cattle, and that the benefit of their stale is lost to the ground, he is convinced the beef is not so good, though perhaps more sightly.

The first stock he began to feed in this manner consisted of twelve neat beasts, and forty-nine shearing weathers, or those not quite two years old: ten of the former were Norfolk bred steers, and began to feed on the first carrots he drew: at the same time he put on a cow, and a heifer three years old. At old Martinmas Mr. Billing bought seventeen Scotch bullocks, which, with a cow from his dairy, made up the number thirty; and soon after he increased this number to thirty-three, by adding three more from his dairy.

It is, however, to be observed, that when the cabbages were spent, he allowed a load of turnips each day for some time for this flock of cattle, which, with three loads of carrots, was a sufficient provision for them. This enabled him to determine, that one load of carrots is nearly equal to two of turnips; for if the cattle had been fed on turnips only, it would have cost him little less than seven loads, computing on the experience of many years fattening cattle with turnips; yet he declares he never knew cattle thrive faster.

Nine of the steers were sold fat in Smithfield on the seventeenth of February, and weighed about forty Norfolk

folk ſtone, that is, ſeventy London ſtone, each. Another ſteer and cow were killed in the country, the latter at Weaſenham town, and which died very fat, about the ſame time: the Scotch were ſold at St. Ives about the beginning of May: the ſteers ſold in Smithfield for about ſeven pounds fifteen ſhillings each.

Our farmer being told the market was then low there, ſold all the Scotch, except one, at St. Ives, where they fetched him about ſeven guineas each.

The former coſt about four pounds ten ſhillings each; the latter, three pounds fifteen. The other Scotch he ſent to London, where, though it weighed but a little above ſixty ſtone, it ſold for eight pounds, and was ſaid to be ſome of the fatteſt beef killed in London that winter, as Mr. Billing was informed by Mr. Brownſworth the ſaleſman: the others were not inferior.

The forty-eight weathers were ſold fat at St. Ives in the month of May, at about fifteen ſhillings each.

Theſe thirty-three beaſts, and forty-eight ſheep, brought Mr. Billing, according to his computation, about one hundred and twenty pounds profit; out of which deducting one tenth for the ſhare the cabbages and turnips had in fattening them, which is rather too much, eſpecially as the cattle ſoon began to leave the turnips, there remains one hundred and eight pounds to be carried to the account of the carrots.

The large quantity of carrots our induſtrious farmer had growing gave him alſo an opportunity of trying their uſe in feeding dairy cows, ſheep, horſes, and hogs.

In the month of April he found he ſhould have nine or ten acres to ſpare, beyond what was neceſſary to complete the fattening his bullocks. This happened too at a time when his turnips, as well as thoſe of his neighbours, began to decay, and enabled him to ſupply that defect, to which the Norfolk farmers are very ſubject in the ſpring of the year, and which no method of managing their turnips ever exempted them from, when the weather is wet and froſty by turns; and from this decay the carrots ſeem protected by their hardineſs. From this time he fed his whole dairy of thirty-five cows, and his flock of twenty-one ſcore of ſheep, on carrots.

At the ſame time he thought of a method of getting the carrots out of the ground with more eaſe and expedition than he had done before, which was of great uſe when he had other occaſions for his ſervants; beſides which it alſo prepared the land better for the enſuing crop.

They were ploughed up with a narrow-ſhared wheel plough; going ſlow, the ſhare opened the earth, and cut very few of the carrots; thoſe few being only ſuch as chanced to meet the very point of the ſhare.

The plat, or earth-board, turned moſt of the carrots out of the ground, and, by harrowing afterwards, were moſt of them quite cleared from the earth. Though the roots extended a good way into the ground, and below the pan, he did not think it neceſſary to plough ſo deep, and conſequently the land ſuffered no damage, which otherwiſe it might have done, as ſome few of the carrots inſtead of being turned out, were buried: it is alſo neceſſary to plough the land and harrow it a ſecond time; but though this ſhould be at an interval of a month, the buried roots will take no harm.

Mr. Billing turned his dairy cows and flock of ſheep on this land after the ploughing, without any further trouble or preparation, and had all the reaſon in the world to be pleaſed with the event: both took readily to eating the carrots, though he thinks the cows more ſo than the ſheep.

The former not only gave more milk than is uſual at that time of the year, but many continued to give milk, which would with ſuch turnips as he had then to give them, have been nearly dry. The butter made was likewiſe much better than that from turnips; and both ſheep and lambs did much better than he ever remembers them to have done at this ſeaſon of the year: beſides this, the land was evidently very much improved from the ſtale of the cattle, of which he plainly perceived the benefit in the enſuing crop.

It is proper to obſerve, that in this method, ſome few of the carrots continue buried, even after a ſecond ploughing; but theſe were turned out upon a third ploughing, when barley was ſown, and were clean eaten up by a flock of ſheep, without any injury to the new ſown barley.

In this manner the cows and ſheep were fed for three weeks, which Mr. Billing values at about twenty pounds; and, conſidering how he might have ſuffered, had he wanted turnips, and not been able to ſupply that want with carrots, he thinks, he might value his feed at a great deal more.

In November 1763, he began to feed ſixteen horſes, which did all his farming work, with carrots: they had neither hay nor corn, except his team that carried his corn to Brancaſter, a ſea-port, at fifteen miles diſtance: to this team he allowed a buſhel of oats a day to the whole team: the reſt had nothing beſides carrots, except peaſe-ſtraw and chaff, until the ſowing barley. In April he increaſed their work ſo much, that he thought it neceſſary to give them a few oats; but they continued to ſubſiſt chiefly on carrots, until they were turned to graſs, the latter end of May.

Mr. Billing declares he never knew his horſes in better order, or do their work better; and they were ſo fond of carrots, that he frequently found, that when the team mentioned before were ſo fatigued, that they refuſed to eat their corn, they would eat it when mixed with the carrots chopped.

It may be proper to obſerve, that he always chopped off the heads and tails of the carrots he gave his horſes, and ſometimes gave them another cut. Though he could not find it was neceſſary, he maſhed them alſo for his horſes, none of which trouble he found at all requiſite or even uſeful for other beaſts: the gathering and removing the carrots, and diſperſing them about the paſture-land where he fed his cattle, were ſufficient.

Mr. Billing gave the ſixteen horſes two loads of carrots every week; and theſe two loads, he computes, ſaved him more than a load of hay; which, at twenty-five ſhillings a load, amounted to thirty-five pounds.

To this might be added, the benefit received by the ſwine, to which he threw all the tops and tails of the carrots uſed for the horſes; and they throve exceedingly, and were ſo fond of them, that he could never find that any dirt which might ſtick to them, prevented their eating them: but as the principal part of the food of the ſwine was milk at firſt, and afterwards peaſe, our farmer has not ſet any value on this part of his profit; the total of what he has eſtimated it on the other articles, amounting to one hundred and ſixty-three pounds.

Of the thirty acres and a half, four were ſown in the year 1764, with oats, all the reſt with barley: the four acres were part of the land where he ploughed up the carrots; the reſt of this piece was ſown with barley: both produced a prodigious crop, not leſs than three loads of corn in the ſtraw, per acre: on the reſt of the land his crop was leſs bulky, and ſhorter, yet very good, perhaps not leſs in the quantity of grain than the other. And here it may not be improper to mention, that when in a former year, he had ſown the two ends of a large cloſe with carrots, without dung, and the middle with turnips, for which the land was well dunged, yet, when the whole encloſure was, the next year, ſown with barley, that after the carrots was the beſt.

Another recommendation of carrots is, that our intelligent farmer finds them a more certain crop, both for growth and duration, than turnips: the latter are exceedingly apt to fail, as well as rot, towards the ſpring, when moſt wanted. Perhaps the former is, in ſome meaſure, owing to the lands in Norfolk being, as the farmers expreſs it, ſurfeited with turnips, to which they have been ſo long accuſtomed. But however this be, there are many reaſons for chuſing both, that if one fail, we may rely, for ſo neceſſary a winter proviſion, on the other.

This candid farmer thinks he ought not, however, to conceal, that at the firſt beginning of a new ſort of huſbandry, many difficulties ſtand in the way: the expence is very heavy, much beyond the expence of turnips, and is, perhaps, increaſed by the aukwardneſs of labouring men and ſervants, who are both ignorant and perverſe about moſt new employments: beſides this, the cleaning of carrots from weeds is much more neceſſary than of turnips, and yet goes on much ſlower, ſo as ſometimes hardly to be completed: and, moreover, if a long continued froſt ſhould happen, it will be very difficult to get carrots out of the ground (indeed the turnips in this caſe are apt to ſpoil); but this inconvenience may, in ſome meaſure, be prevented, by drawing the carrots before the froſt; though this will be attended with difficulty when the quantity amounts to fifty or a hundred loads.

Such is the account given by Mr. Billing, with regard to the culture and uſe of carrots, for the feeding of cattle. And as theſe experiments were made ſo much at large, the farmer may, without heſitation, adopt this method; and if his ſoil is adapted to the growth of carrots, he need not doubt of greatly increaſing his annual profit. That they are wholeſome feed for cattle has been long known; but that ſuch advantages reſulted from their uſe as Mr. Billing relates, few farmers could have imagined.

Wild CARROT, *Bird's-neſt*, or *Bees-neſt*, the name of a biennial weed common in paſture grounds. It greatly reſembles the cultivated carrot, of which indeed it is only a ſpecies. The wild ſort however differs from the cultivated in its roots, which are ſmall and ſticky. In both ſorts, after they have done flowering, the umbels contract themſelves into the ſhape of a bird's neſt.

CAR SICK, a term uſed in ſome of the northern counties to ſignify the cart-rut, or gutter made by the wheel of a cart or waggon.

CART, a vehicle mounted upon two wheels, and drawn by one or more horſes.

The chief difficulty in the conſtruction of wheel carriages, conſiſts in properly adapting the wheels and axle, which ought to be done in ſuch a manner, that the carriage may move with the leaſt force poſſible. *See the article* WAGGON.

CART-LODGE, a ſmall out-houſe for ſheltering carts, waggons, &c. from the weather.

Farmers ſhould be very careful to place their waggons, carts, &c. under proper ſhelter, when out of uſe, as they will laſt twice as long by this means, as they would if expoſed in the yard to all weathers; for as they are thus ſometimes wet, and ſometimes dry, they ſoon rot, and become unfit for uſe.

CART-LADDER, a kind of rack, placed occaſionally at the tail of a cart or waggon, to make it hold the larger quantity of hay, ſtraw, &c.

CART-RAKE, the cart track, or furrow made by the wheels of a cart or waggon.

CART-RUT, the ſame with cart-rake. *See the preceding article.*

CARTWRIGHT, a perſon whoſe buſineſs it is to make carts, waggons, &c. generally called a wheelwright.

CARUE, or KERUE, ſour. Thus to carue, ſignifies to grow ſour, and is generally applied to cream.

CARUNCLE *of the eye*, the fleſhy ſubſtance in the inner corner of a horſe's eye, next the noſe.

CASINGS, or COW-BLAKES, dried cows dung, uſed in ſeveral parts for fewel.

CAST, a flight of birds, inſects, &c. Thus a caſt of bees, ſignifies a ſwarm or flight of bees.

CATCH-FLY, the Engliſh name of a ſpecies of lychnis, now greatly cultivated in gardens.

The double flowering ſort of catch-fly was accidentally obtained from the ſeeds of the ſingle; and has not been known above forty years in the Engliſh gardens. As this ſort never produces ſeeds, ſo it can only be propagated by parting and ſlipping the roots; the beſt time for this is in autumn, at which time every ſlip will grow. If this be performed in September, the ſlips will have taken good roots before the froſt, and will flower well the following ſummer; but if they are expected to flower ſtrong, the roots muſt not be divided into ſmall ſlips, though for multiplying the plant, it is no matter how ſmall the ſlips are. Theſe ſhould be planted on a border expoſed to the morning ſun, and ſhaded when the ſun is warm, till they have taken root. If the ſlips are planted in the beginning of September, they will be rooted ſtrong enough to plant in the borders of the flower-garden, by the middle or latter end of October. The roots of this ſort multiply ſo faſt as to make it neceſſary to tranſplant and part them every year; for when they are ſuffered to remain any longer, they are very apt to rot. It delights in a light moiſt ſoil.

It has the name of catch-fly, from a glutinous liquor, almoſt as clammy as bird-lime, ſweating out of the ſtalks under each pair of leaves; ſo that the flies, which happen to light on theſe places, are faſtened to the ſtalk, where they die.

CATCH-LAND, a name given to ſuch land as is not certainly known to which pariſh it belongs; and therefore the miniſter, who firſt gets the tithes of it, enjoys it for that year.

CATERPILLAR, a general name for all inſects of the butterfly kind, while they continue in their reptile or worm ſtate.

It is well known, that all winged inſects paſs through a reptile ſtate, before they arrive at perfection. This great change from a worm to a fly, or butterfly, was formerly eſteemed a real metamorphoſis, or change of one animal into another; but later diſcoveries have put it beyond all doubt, that the embrio butterfly, with all the lineaments of his parent, is contained within the external caſes, or coverings of the caterpillar. When the included animal has acquired a ſufficient degree of ſtrength, theſe coverings are thrown off, and it appears in its genuine form of a fly, or butterfly. It muſt, however, be obſerved, that before the creature can free itſelf from theſe coverings, it muſt paſs through a ſtate of reſt, called by naturaliſts nymph, or chryſalis ſtate.

Mr. Hitt obſerves, that there are two ſorts of caterpillars, at leaſt thoſe of two colours, which feed upon fruit-trees, the one black, and the other green. The black generally make their appearance in March, if the ſeaſon be dry, upon the pear, apple, and ſeveral other trees.

Sometimes great numbers of them are contained in a ſort of kel, or web, and, if they are to be come at, ſhould be taken off; for otherwiſe they will diſperſe themſelves to all parts of the tree, and there feed upon the bloſſoms, leaves, or their buds, before they are unfolded. After they have lived ſome time in this active ſtate, they generally conceal themſelves in a bunch of leaves, or in a cavity of the rind of a tree, where many of their eggs are hatched the ſame ſummer, and become very deſtructive. There is alſo reaſon to think, that ſome of their eggs are preſerved in thoſe places during the winter, as many of them, and ſome kindled or animated, have been found in old nail holes, and under pieces of dead bark, during the month of February.

The walls ſhould therefore be well waſhed, and the dwarfs and ſtandard trees well dreſſed and cleanſed at that ſeaſon.

The green caterpillars, which may, perhaps, be the ſame with the former at their firſt appearance, till their colour is gradually changed by living wholly on green food, are never ſeen ſo early in the ſpring as the former; but are very prejudicial to both the young branches and fruit of the apricot, cherry, plum, apple, pear, currant, gooſeberry, &c.

They are never ſeen in great numbers together incloſed in a kel or web; but are generally found ſingle, wrapt up in the extremity of a new made branch of the abovementioned trees, or in a bunch of bloſſoms of an apple, pear, or cherry-tree, and ſometimes on an apricot, with a leaf to cover them. Part of their bad effects may be prevented in wall-trees, or dwarfs, whoſe branches are within reach. If they be at the extremity of a branch, it will appear in a round knob, and they generally eat off the part they had wrapt together, which ſpoils the branch the next year. When they have incloſed themſelves in a bunch of bloſſoms, or young fruit, then they prove very deſtructive, by generally eating into all they had joined together, which cauſes much fruit to drop off ſoon after, and others when they are more grown.

Some of thoſe which are but ſlightly eat, will continue upon the tree till the time of gathering; but they never make good fruit, being generally ill taſted, and many times have a white grub within them.

When

When the caterpillars are firſt perceived upon the wall or dwarf trees, whether before or after they are wrapt up, a brine ſhould be prepared, and the trees ſwept all over with a bruſh or beſom dipt in it. This will deſtroy many of the inſects, by beating ſome off, and killing others. This work ſhould be often repeated, if there be a neceſſity for it, as there generally is in dry ſeaſons. Perhaps a ſmall engine would be the propereſt and moſt effectual inſtrument for this work.

But gentlemen, who have leiſure ſufficient, may eaſily preſerve their fruit-trees from the ravages of caterpillars, by carefully inſpecting them every day in the ſpring; for it will eaſily be ſeen when a bunch of bloſſom-leaves, or young fruit, are joined together by a caterpillar; and, on the firſt diſcovery, the leaves are to be ſeparated by the hand, and the caterpillars killed; this will ſave a young branch or bunch of fruit, which would otherwiſe have been certainly deſtroyed. Whoever perſeveres in this work will never have much of their fruit deſtroyed by ſuch inſects, which experience has ſufficiently demonſtrated to be more deſtructive to the fruit, than any other cauſes that happens in the ſpring, though many will attribute the ſcarcity of fruit to blaſts or lightnings, or to the branches being ſun-burnt, which are the common conſtructions put upon the effects of theſe inſects.

When ſtandard trees are properly ordered with cutting and dreſſing, they will not be much ſubject to be infected with caterpillars; for by taking off the old rind, and cleaning the cankered parts of thoſe trees, many of the inſects are deſtroyed, together with their eggs concealed in thoſe places; and by keeping the branches thin and open, they are more eaſily ſhaken off by the winds. *Hitt on Fruit-Trees, page* 265.

Caterpillars not only deſtroy the leaves and bloſſoms of fruit-trees, but they alſo deſtroy cabbages, and other productions of the garden; and are generally the effect of great drought.

To prevent their numerous increaſe on trees, gather them off in winter, taking away the prickets which cleave to the branches, and burn them; but if they get on cauliflowers or cabbages, take ſome ſalt water, or ſtrong brine, and water the plants with it, and it will kill the inſects: the ſame effect will be produced by taking ſome of the caterpillars themſelves, bruiſing them with garlic, and infuſing the mixture in water; or you may ſmoke them with wiſps of dry ſtraw in March, juſt as the bud begins to open.

In the ſummer while they are yet young, when, either through the coldneſs of the night, or ſome humidity, they are aſſembled together on heaps, you may take and deſtroy them; or you may waſh your trees with water, in which wormwood, tobacco-ſtalks, and coloquintida have been diſſolved; or take lime duſt, and when the wind is high, and the trees wet, ſprinkle the duſt, ſo that the wind may blow it on the trees. *Mortimer's Huſbandry, vol. I p.* 325.

CATKINS, a name given to ſuch flowers as have an aggregate of ſummits hanging down, in the ſhape of a rope, or cat's tail.

CAT's-FOOT, a name given in ſome countries to ground ivy.

CAT's-TAIL, a round ſubſtance growing upon nut-trees.

CATTLE, a general name for beaſts of paſture, that are neither wild nor domeſtic; but generally confined to thoſe of the ox kind.

Cattle are known to be very advantageous to the breeders of them; and therefore thoſe in middling fortune would do well to apply ſome part of their time and farms to this uſeful work: but people in theſe circumſtances, finding it impracticable to make large profits, too often reject, with diſdain, the ſmall advantages continually in their power. In vain the wiſe man informs them, that whoever neglects ſmall profits will daily decay; in vain reaſon dictates, that from a ſmall ſtock, they muſt be contented with ſmall gain; but that a great number of ſmall profits, which it is eaſy to multiply by labour, becomes in a ſhort time an object of conſideration.

It muſt not however be imagined, that in order to derive a conſiderable advantage from cattle, it will be ſufficient to have a great number, and to give them the neceſſary fodder: there are many other circumſtances to be attended to, without which it would be in vain to flatter ourſelves with the expectation of riches. They are often kept in too narrow a cow-houſe, from whence many inconveniencies ariſe. Sometimes they fight, and wound one another. The moſt voracious ſtarve their neighbours, from whom they carry off all the fodder within their reach; and the injured cows decay inſenſibly, become languid, or give little milk. In ſummer the heat incommodes them, a circumſtance which makes them grow lean, and diminiſhes the quantity of their milk. Care muſt therefore be taken that they have ſufficient room in their ſtalls; that they be cool in ſummer, and warm in winter. At all ſeaſons let them be dry, for that is a material point. Even in ſummer, humidity is diſagreeable to them, and in winter it chills them. To prevent this double inconvenience, it will be proper to pave the cow-houſes on a gentle deſcent, and to dig a pit to collect all water and ſtale. By this means the cattle will lye always dry, and the ſtale be collected for good purpoſes. Horned cattle ſometimes contract a habit of licking one another; and that injures ſo much, that a butcher who perceives it, will give leſs money for them than for others. They are cured of this habit, by rubbing the places they have licked with cow dung, the bitterneſs of which prevents them from purſuing it.

We ſhall inſiſt on the advantages attending the breeding of young cattle, whatever trouble it may coſt; becauſe there is no prudent countryman who is not fully perſuaded they are real. To buy what he may have of his own growth is to a farmer no acquiſition, but a diſſipation; becauſe the land produces no money, which is only to be obtained by the ſale of commodities, and very often the purchaſe of ſome goods deſtroys all the profit reſulting from the ſale of others. It ought, therefore, to be an inviolable maxim, eſpecially with thoſe in narrow circumſtances, to ſpare no pains in improving their ſtock, not making ſmall eſtimation of what has coſt them no money, but frugal as if they had bought it. By this means, if we accept unforeſeen accidents, which can never be prevented, they will find wealth flow in upon them annually, though ſlowly, and lay the foundation of a ſolid fortune. *Journal Oeconomique.*

Fattening and feeding CATTLE. Cattle are bought in to fat at ſpring, and about Michaelmas. Thoſe you buy in at ſpring will be fat in July, Auguſt, or September, according as they are forward, and you have keeping for them; and thoſe which you buy in Auguſt, September, or October, muſt be either to ſell in winter or in ſpring, and muſt be forward in fleſh to be improved the beginning of winter, and only kept up in fleſh during the hard time of winter, either with burnet hay, turnips, carrots, &c. to be fit for a good market whenever it offers; or they muſt be young, lean, cattle, that may by their growth pay for their wintering, and to be fit to fat the next ſummer. Some upon ordinary land buy in young Welch heifers, which, if they prove with calf, they ſell in ſpring, with a calf by their ſide for the dairy; and thoſe that are not with calf they fatten: all which ways turn to good account, according as prices fall out; but moſt commonly all meat, either at Chriſtmas or in the ſpring, is one third part dearer than in ſummer: becauſe all have not the conveniency either of hay, turnips, &c. to fatten cattle with in winter; and it is but in a few places, eſpecially near London, which is the chief market for fat cattle, that hay can be afforded to fatten them with; for they reckon an ox, that coſts about ſix pounds, will require about two loads of hay to keep him up all the winter.

For the wintering of cattle, you muſt about September turn out them you deſign to keep up for a winter or a ſpring market, and your cows, that give milk into your rowens, till either ſnow or a hard froſt comes on, as by that means they will need no fodder; but when either ſnow or froſt comes, you muſt give hay to ſuch cows as are near calving, or thoſe that have lately calved, or that give a great deal of milk, and alſo to your fattening cattle. This muſt be done every morning and evening, in proportion to the quantity of rowen you have upon the ground; for the more rowen you have, the leſs quantity of hay will do, and even the ſour graſs which your cattle would not eat before, will, when the froſt hath taken it,

become,

become good, fweet food for them, and what they will eat with pleafure, if it be not covered fo deep with fnow, that they cannot come at it. But for your lean cattle, and thofe that give but little milk, ftraw will do well enough to fodder them with; only you muft obferve to give barley-ftraw firft, and the oat-ftraw laft, except you value your milk: if you do, give fuch cows your oat-ftraw, provided the quantity of milk they give doth not deferve hay, or hay be fcarce with you; for barley-ftraw will quite dry up the little milk they have, though it is good food for dry cattle. But if your hay and carrots fail you, pour fcalding hot water upon your malt-duft, and, when near cold, give it the cows you defign to continue the milk of, and it will caufe them to give a great deal, though they eat ftraw with it. A bufhel, which cofts about three-pence, will be fufficient for a cow a week. But about London, where they have grains in plenty, they give them to their cows in winter, which makes them give a great deal of milk; but is apt to rot them, if given in too great quantities, and for too long a time.

When your rowen is quite eaten up, which will commonly be about February, you muft houfe your milch-cows, which you give hay to all night in your cow-houfe, and your other cattle in your yard: for which ufe you fhould have two yards; one for your cattle which eat ftraw, with racks and other conveniencies to fodder them in; obferving to feed them often, and not to give them too much at a time; becaufe when they have blown upon it, they will not eat it; both your yards ought to be well fheltered, and made as dry as poffible, and a good deal of ftraw given them to lye dry and warm in, which is a very great advantage to them, and will greatly increafe the quantity of your dung.

As to the buying of fat cattle, milch-cows, or lean cattle, experience, and the advice of fuch perfons as underftand them are the beft inftructors.

For the feeding of land, you may do it with beafts and horfes together, or with beafts firft, and horfes afterwards; and after both put in fheep. But let not your grafs be too rank before you feed it; for if you do it will be four, and your cattle will eat the tops only, fo that the other part will lie untouched, and rot upon the ground, as hardly any beaft will eat four grafs, till the froft hath taken it, except Welch heifers. Obferve alfo, where you have inclofures, to be often changing of your cattle from one pafture to another; for by that means you will give your land an opportunity of getting a frefh head, frefh grafs being a great help to the feeding of cattle. *Mortimer's Hufbandry, vol. I. p.* 231.

Cattle are frequently well fed in the winter with rye-ftraw, mixed with a little hay; with the ftraw or halm of buck wheat; with the leaves of white beet; with turnips, the turnip-cabbage, carrots, cabbages, burnet, and the bruifed tops of furze; as may be feen under each article. They are alfo well fed and fatted with the cakes of lin-feed and rape-feed, or cole-feed. *See the articles* COLE-SEED *and* LIN-SEED.

It is really furprizing that though plants have been conftantly obvious to the eyes of every man, nothing has been delivered down to us in any book, concerning the kinds of plants proper for the different kinds of cattle; the confequence of which inattention frequently is, that the farmer, by not diftinguifhing and felecting the feeds of proper graffes, fills his paftures with weeds, or, which is here equivalent to them, with bad graffes, unfit for the nourifhment of the animal he intends to rear.

The illuftrious Linnæus in his journey through Dalecarlia in the year 1734, made the firft attempt to lay down rules for the farmer's direction in this interefting fubject. In this journey he obferved, that the horfes eafily diftinguifhed wholefome from noxious food; for, being very hungry, they devoured all forts of plants, except the meadow-fweet, valerian, lilly of the valley, angelica, loofe-ftrife, marfh-cinquefoil, crane's-bill, hellebore, monkfhood, and feveral fhrubs. This gave him a hint to recommend to the curious to apply themfelves to examine what plants fuch animals as live on vegetables will not touch.

The ingenious author of the Swedifh Pan, in order to encourage inquiries of this kind, very properly obferves, that we admire the wifdom of the Creator, which has made fome vegetables abfolutely difagreeable to fome animals, while they are agreeable to others; and plants, which are poifonous to fome, are wholefome to others. This did not happen by chance; it was ordained for wife purpofes: for if the Author of nature had made all plants equally grateful to all kinds of quadrupeds, it muft neceffarily have happened, that one fpecies of them having remarkably increafed, another fpecies muft have perifhed by hunger, before it could have got into better pafture. In like manner we find it contrived in relation to the plants themfelves, which do not all grow in the fame country and climate; but every plant has its place, in which it grows more abundantly than elfewhere. From hence we may obferve, that thofe animals which live chiefly upon particular plants, abound moft in certain places. Thus one animal leaves that which is poifonous to itfelf, for another animal, which feeds upon it delicioufly. Long-leaved water hemlock will kill a cow, whereas the goat browfes on it greedily. Monkfhood kills a goat, but will not hurt a horfe. Parfly is deadly to fmall birds, while fheep, hares, rabbits, and fwine eat it fafely; and pepper is mortal to fwine, and wholefome to poultry. Hunger will often drive animals to feed upon plants which nature never intended for them: but after this has happened once, they become more cautious for the future.

Perhaps many of the terrible difeafes to which cattle are fubject, and which has fwept away innumerable multitudes, may, in part at leaft, be owing to the mixture of noxious plants among their food. The great Linnæus was of this opinion; and the following paffage in the writings of that admired naturalift is too interefting to be omitted in a work of this kind:

" When I arrived, fays he, at Tornea, the inhabitants complained of a terrible difeafe then raging among the horned cattle, which died by hundreds, foon after their being let into the paftures in the fpring. They defired I would confider this affair, and give them my advice what was to be done, in order to put a ftop to this evil. After a proper examination, I thought the following circumftances worth obferving:

" 1. That the cattle died as foon as they left off winter fodder, and returned to grazing.

" 2. That the difeafe diminifhed as the fummer came on; at which time, as well as in the autumn, few died.

" 3. That this diftemper was propagated irregularly, and not by contagion.

" 4. That in the fpring, the cows were driven into a meadow near the city, and that they chiefly died there.

" 5. That the fymptoms varied much, yet agreed in this; that the cattle, in grazing indifcriminately on all forts of herbs, had their bellies fwelled, were feized with convulfions, and in a few days expired with dreadful bellowings.

" 6. That no man dared to flea the recent carcaffes; as they found by experience, that not only the hands of fuch as attempted it, but their faces too, had been inflamed and mortified, and that death had enfued.

" 7. The people enquired of me, whether there were any kind of poifonous fpiders in that meadow; or whether the water, which had a yellowifh tint, was not noxious.

" 8. That it was not a murrain was clear, becaufe the diftemper was not contagious, and becaufe that diftemper is not peculiar to the fpring. I faw no fpiders but what are common all over Sweden; and as to the water, the fediment at the bottom, which caufed the yellownefs, was nothing but what came from iron.

" 9. I was hardly got out of the boat which carried me over the river into the meadow, before I gueffed the real caufe of the difeafe; for I there beheld the long-leaved water hemlock. My reafons for gueffing this were the following:

" 10. Becaufe in that meadow where the cattle firft fell ill, this poifonous plant grows in great plenty, chiefly near the banks of the river. In other places it was fcarce.

" 11. The leaft attention will convince us, that brutes fhun whatever is hurtful to them, and diftinguifh poifonous plants from thofe which are falutary, by natural

tural inſtinct; ſo that this plant is not eaten by them in the ſummer and autumn, which is the reaſon that few cattle died in theſe ſeaſons; thoſe only which eat of it by accident, or were driven to it by extreme hunger.

" 12. But when they are let into the paſtures in the ſpring, partly from their greedineſs after freſh herbs, and partly from the hunger they had undergone during the winter, they devour every green thing that comes in their way. It alſo happens that herbs, at this ſeaſon, are ſmall, and ſcarcely ſupply food in ſufficient quantity. They are beſides more juicy, are covered with water, and ſmell leſs ſtrong; ſo that what is noxious is not eaſily diſcerned from what is wholeſome. I obſerved likewiſe, that the radical leaves were always bitter, and the others not, which confirms what I have juſt ſaid.

" 13. I ſaw this plant in an adjoining meadow mowed along with graſs for winter fodder; and therefore it is no wonder, that ſome cattle, though but a few, ſhould die of it in the winter.

" 14. After I left Tornea, I ſaw no more of this plant, till I came to the vaſt meadows near Limmingen, where it appeared along the ſides of the road; and when I got into the town I heard the ſame complaints as at Tornea, of the annual loſs of cattle, with the ſame circumſtances.

" 15. It would therefore be worth while to eradicate carefully theſe plants, which might eaſily be done, as they grow on marſhy grounds, and generally by the ſides of pools and rivers. But if this cannot be performed, the cattle ſhould not be ſuffered to go into ſuch places, at leaſt during the ſpring: for I am perſuaded that later in the year they can diſtinguiſh this plant by the ſmell alone." *Lin. Flora Lapponica.*

Were experiments carefully and judiciouſly made on the above beneficial plan, we ſhould ſoon know with certainty what ſpecies of animals any paſture affords the beſt nouriſhment for. We ſee, for example, heifers fall away in encloſures, where the meadow-ſweet grows in abundance, and covers the ground ſo that they can hardly make their way through it: while the country people, imagining that the paſture is too rich for them, are quite amazed, and never dream that the meadow-ſweet affords them no nouriſhment: whereas the goat, which ſtands bleating on the other ſide of the hedge, is not ſuffered to go in, though he longs to be browzing upon this plant, which is to him a moſt delicate and nouriſhing food. Long experience has taught us, that ſheep take up poiſon in marſhy grounds, though no one till lately knew what the particular poiſon was: yet the ſpiderwort, the mouſe-ear ſcorpion graſs, the mercury, the ſun-dew, the hairywood-graſs, the leſſer ſpearwort, and the butterwort, have evidently ſuſpicious marks.

Hence we ſee, that what makes low grounds ſo noxious to ſheep is not wholly the moiſture, but the plants which grow there; for it is remarked by ſhepherds, that the great danger to ſheep is immediately after a freſh ſpring of graſs, when it is natural to think they lick up the young and tender ſhoots of poiſonous plants along with their proper food, not being then able to diſtinguiſh the one from the other.

From obſervations of this kind the huſbandman may form a right judgment of his meadows, and turn into each the animals beſt adapted to the nature of the paſture.

" The induſtrious farmer, ſays the author of the Swediſh Pan, may judge from hence, when he ſows his meadows with hay-ſeeds for paſture, that it is not indifferent what kind of ſeeds he chooſes, as the vulgar inadvertently think: for ſome are fit for horſes, other for cows, &c. Horſes are nicer in chooſing than any of our cattle. Plants, whoſe ſeeds grow in pods, are particularly reliſhed by them. Goats feed upon a greater variety of plants than any other cattle; but then they chiefly hunt after the extremities and flowers. Sheep, on the contrary, paſs by the flowers, and eat the leaves. And again, different animals have different diſpoſitions as to grazing more or leſs near to the ground. The huſbandman, who underſtands theſe things, and who, in conſequence thereof, knows how to lay out his lands, ſo as to aſſign to each ſort of cattle its proper food, will neceſſarily have his flocks and herds healthier and fatter, than he who is unacquainted with theſe principles. The good manager will alſo obſerve the ſame precautions in the making of his hay: for although many herbs are eaten when dry, which would be refuſed while green, it does not from thence follow, that they yield good nouriſhment. Much might be added concerning the propenſity of cattle to this or that plant: for example, that ſheep delight above all things in the feſcue graſs, and grow fatter upon it, than on any other kind of graſs; that goats prefer certain plants, but, being led by an inſtinct peculiar to themſelves, they ſearch more after variety, and do not willingly ſtick long to any one kind of food; that geeſe are particularly fond of the ſeeds of feſcue graſs; that ſwine hunt greedily after the roots of bullruſh, while they are freſh, but will not touch them when they are dry." *N. Haſſelgren. Amœnit. Academ. Suec. tom. II.*

If a farmer, ſays the intelligent Mr. Liſle, intends to graze cattle in a hill country farm, theſe three things are eſpecially to be regarded; firſt, to raiſe a good quantity of French graſs for hay and aftermaths. Secondly, to turn a good quantity of hill country meadow into rich paſture, by feeding it, dunging it, and laying on it other manure, to make it fit for raiſing the bullock or heifer in the ſpring, when he comes firſt from hay into graſs-leaſe, and to receive him with a vigorous aftermath, when other graſſes, as clovers, and French graſs aftermath, goes off. Thirdly, to have hovels in your bartons, incloſed with cloſe court-walls, to ſhelter your cattle in the winter from wind and rain. All theſe three things are neceſſary and uniform, correſponding with one another; without them, grazing muſt be carried on very defectively, and to little profit, by the hill country farmer.

By the methods here preſcribed, in order to the fattening of cattle, plenty of French graſs hay will enable the grazier to purchaſe barren beaſts before the ſpring graſs comes, when it is moſt likely they will be cheap, and may be bought to the beſt advantage, allowing the value of the hay they may eat in conſideration with the purchaſe; and if by winter-hayning ſome meadow ground (after it has been kept high in heart, by feeding and ſoiling it) you can early in the ſpring, by April, or ſooner, have a bite to take off ſuch grazing beaſts from hay to graſs, it will be very advantageous before clovers can be ready, which are ſeldom ſo, in the hill country, till a week or fortnight in May; and by hayning up ſuch meads for an aftermath, which towards the end of ſummer are in very good heart, you will ſupport your bullock, and carry him on when the ſpirit of other graſſes fail. Then ſuch cattle as are unfiniſhed being brought to French graſs hay, and tied up under hovels or coverings, and within court-walls, will proceed in thriving by being ſecured from the wind and rain, and the tedious hill country rimes, that often continue whole winter days, all which makes cattle brought from graſs to pitch, and maſhes them out. Beſides, if you have not plenty of French graſs hay, you cannot make the beſt of a milch-cow that warps, or of a cow that towards the latter end of winter you may perceive proves barren, or of a fat cow that caſts her calf before you kill her. The neceſſity of French graſs hay only, and not of clover hay, is mentioned here, becauſe it is ſuppoſed that the hill country farmer, who provides ſtore of French graſs hay, will be wiſe enough not to mow his clover, to feed them, in order to improve his lands; for the hill country farmers have generally ſo much land for their money, that all they can do is little enough to keep their arable land in ſuch heart as it ought to be in for their profit.

If the foregoing cautions are not obſerved, the ill conſequences that will follow muſt be ſuch as theſe: if the firſt of the three foregoing cautions be diſregarded, your cattle cannot at any time of the year be made fat, as they ought to be, and then you muſt be under the neceſſity of ſelling them half fat, of which neceſſity the buyer never fails to take the advantage; and ſell them you muſt, notwithſtanding there be ever ſo fair a proſpect of prices riſing in a month or two; and you will commonly find, that you have nothing for the meat they have eat whilſt they have been fattening. In the ſecond place, we will ſuppoſe that very few will be ſo unwiſe, as to to begin to fat a beaft in October with hay, and fo to keep him upon hay during the winter: but we may reafonably fuppofe, that warping beafts, barren heifers, &c. may, and commonly are begun to be fatted with hay from Chriftmas, in which cafe, though hay be plenty, yet if an early fpring grafs be wanting, fuch cattle muft be kept on it, at leaft, till the middle of May; for till then, in the hill country, it will not give a beaft a bite, and then commonly, where the mafter is at a lofs and difappointed, the cattle evidently fuffer before he can make the moft of them, and, in this cafe, he will find a beaft plainly pitch before he can find a purchafer for him. Again, if early fpring grafs be wanting, you cannot begin fummer fattening of cattle, nor buy a barren heifer till towards the middle of May, and then they are commonly very dear; and, in the hill country, from fo late a beginning, the fummer grafs will hardly fat a beaft, the ground falling early off its ftrength, being generally poor. And then, if you have not a quick growing aftermath treafured up, by keeping fuch ground as was formerly meadow in good heart for that purpofe, it is plain you muft again run into the firft evil; and, if you have fuch an aftermath, you may again often want hay in November and December, to finifh fummer fatted beafts: fo that plenty of hay is always neceffary, &c. And, laftly, though you have both hay and grafs, if you want winter fhelter, the cattle muft fuffer.

All fattening cattle, whether lambs, fheep, barren cows, or oxen, require a proportionable progreffion from coarfer to better food, as they grow more and more into good flefh; otherwife when half fat they will go back, and you will not without great difficulty raife them again, which will be a great lofs; nor will fuch beef fpend kindly.

A gentleman, who would make a good hill country grazier, ought, againft the time he buys in his heifers, to take care to be provided with an overplus ftock of middling good hay, or of winter vetches, or of barley ftraw, and autumn grafs, mixed together, layer and layer of each. Be it what it will, it ought to be at leaft better than barley ftraw; for he is to fuppofe he has bought barren heifers, which have been kept all the winter upon ftraw: if they have been kept better, for inftance, on ftraw and rowet, there is ftill the greater reafon for him to mend their keeping; and he is, from the time of buying, to confider, that he ought to begin to raife them in flefh; for the better cafe they are in when turned to fpring grafs, they will take to fattening the kinder, and bear their firft fcouring the better. If he could turn them into the field, for an hour or two in the day, where there is a little rowet, it would do well, and to have change of the above dry meats would keep them the better to their ftomachs.

Oxen are turned off to fattening at two feafons of the year, which, in feveral refpects, are very convenient. The firft is about May-day, when the labour of the ox is pretty well over for the fpring feafon, the fpring corn being then generally all fown. The fecond is the beginning of winter, namely, from the firft of October, to the middle of November, when the wheat and winter vetches are generally all fown, and the ploughman's hurry relaxes.

Oxen turned out at May-day will hardly get fat before Chriftmas, and if not turned out till June, will not be fat till March, April, or May; which again falls out very fortunately, becaufe from Chriftmas till the latter end of May cow-beef is very fcarce, and is generally fupplied with ox-beef; but then it is obvious, when an ox gets half, or three quarters fat by or before winter, he muft be fupported and carried on by a great quantity of hay, and that very good, for the beaft will then grow nice.

Thofe that are turned from the plough in October and November, ordinary food will ferve for fome time; for fhould you lay the beft hay before fuch an ox, then hungry and poor, he will devour more than the profit. The moft you can propofe by this method is to get him fat by July, inftead of September or October; during all which interval of time, heifer-beef will be plenty, and fink the price of ox-beef; fo chargeable a method therefore will not quit cofts.

What the grazier ought to do in this cafe is to bring his ox eafily and gently into good flefh by a rowet; for which purpofe he ought to have hayned up his grounds, and of which rowet he fhould give him the worft firft, except it be of fo four a kind as to want the correction of the winter frofts before he will eat it, of which kind ftubble rowet commonly is, and in fuch cafe that food muft be referved till then, or rather for young beafts and milch-cows. He ought to give him variety of dry meat along with his rowet, in which he fhould confult his tooth, by flinging before him, alternately, every fort of good ftraw, giving now and then a lock of winter vetches, or coarfe hay, but of every thing good in its kind, *i. e.* fweet and well made; and thus the ox ought to be carried on throughout the winter. About the beginning of March he ought to have better hay; not only becaufe the rowet may be fuppofed to be all gone, but alfo becaufe the ox, mending in flefh, grows nicer, and will be weary of dry meat, through the tedioufnefs of being foddered fo much with it during the winter; therefore his hay muft be mended, for not proceeding is going back. Againft April, if poffible, a fhort head of grafs fhould be got for him in your pafture grounds for cow-cattle, by hayning the pafture in February, that he may have grafs along with his hay, as was before obferved in the fattening of barren heifers; and againft May a head of hop clover muft be in readinefs, in the hill country, to receive him into his firft full grazing; for it is not to be fuppofed that the meadows of the hill country, which according to this fcheme are to be converted into pafture, can be fit before the firft of June to entertain a grazing ox; and it is alfo to be noted, that in the hill country, in the month of May, hop-clover will not afford a good bite for an ox or cow, unlefs the autumnal bud be hayned, and preferved by being fed by fheep: in the month of May, if it fhould prove a dry fpring, the fattening oxen and cows muft alfo have good hay given them, with their hop-clover, if it be fhort.

Fattening in the hill country, efpecially if you give your cattle hay in the winter, is more chargeable than in the vale; not only becaufe hay is dearer there, but alfo becaufe the winter feafon begins a month fooner, and continues a month later in the former than in the latter. The farmer in the hill country muft likewife, by forcing nature as it were, provide rowet and feveral forts of graffes in their due order, exactly accommodated to the feafon of the year, befides winter meat, &c. Whereas all may be procured by the latter in the natural courfe, with very little care and trouble.

It will be neceffary to obferve, that every hill country grazier goes to work without his tools, who does not lay down from fifty to an hundred acres of land proper for it, with French graffes, not only on account of making up the deficiency of the meadows not laid down to pafture, being converted to other ufes, but alfo to anfwer many other demands. *Lifle's Obfervations in Hufbandry, vol.* II. *pag.* 18.

A ftalled ox in the winter, if he be kept to hay only, will eat at leaft a load every two months. *Ibid. p.* 5.

Fourteen pounds weight of hay is the conftant allowance on the road to every fat beaft that is drove to London; they that entertain cattle fling fourteen pounds of hay for each beaft into the rack in the evening when they come into the inn, which is to ferve alfo next morning for their breakfaft; fo that half a tod, or feven pounds of hay, is fuppofed fufficient for a fat ox's bait at night, and the fame in the morning. *Ibid. pag.* 9.

For the manner of feeding and fattening cattle with cabbages, carrots, turnips, turnip-cabbages, &c. *See the articles* CABBAGE, CARROTS, *&c.*

CAULIFLOWER, or COLLIFLOWER, a fpecies of cabbage, lately fo far improved in England, as to exceed in goodnefs and magnitude thofe produced in moft parts of Europe.

Having procured a parcel of good feed, you muft fow it about the twenty-firft of Auguft, upon an old cucumber or melon-bed, fifting a little earth over the feeds, about a quarter of an inch thick; and if the weather fhould prove extreme hot and dry, you fhould fhade the bed with mats to prevent the earth from drying too faft, and

and give it gentle waterings, as you may fee occafion. In about a month's time after fowing, your plants will be fit to prick out; you fhould therefore put fome frefh earth upon your cucumber or melon-beds, or, where thefe are not to be had, fome beds fhould be made with a little new dung, which fhould be trodden down clofe, to prevent the worms from getting through it; but it fhould not be hot dung, which would be hurtful to the plants at this feafon, efpecially if it proves hot; into this bed you fhould prick your young plants, at about two inches fquare, obferving to fhade and water them at firft planting; but do not water them too much after they are growing, nor fuffer them to receive too much rain, if the feafon fhould prove wet, which would be apt to make them black fhanked, as the gardeners term it, which is no lefs than a rottennefs in their ftems, and is the deftruction of the plants fo affected.

In this bed they fhould continue till about the thirtieth of October, when they muft be removed into the place where they are to remain during the winter feafon, which, for the firft fowing, is commonly under bell or hand-glaffes, to have early cauliflowers, and thefe fhould be of an early kind; but in order to have a fucceffion during the feafon, you fhould be provided with another more late kind, which fhould be fown four or five days after the other, and managed as was directed for them.

In order to have very early cauliflowers, you fhould make choice of a good rich fpot of ground, that is well defended from the north, eaft, and weft winds, with hedges, pales, or walls; but the firft is to be preferred, if made with reeds, becaufe the winds will fall dead in thefe, and not reverberate as by pales, or walls. This ground fhould be well trenched, burying therein a good quantity of rotten dung; then level your ground; and if it be naturally a wet foil, you fhould raife it up in beds about two feet and a half, or three feet broad, and four inches above the level of the ground: but if your ground is moderately dry, you need not raife it at all: then plant your plants, allowing about two feet fix inches diftance from glafs to glafs, in the rows, always putting two good plants under each glafs, which may be at about four inches from each other; and if you defign them for a full crop, they may be three feet and a half, row from row: but if you intend to make ridges for cucumbers between the rows of cauliflower plants, as is generally practifed by the gardeners near London, you muft then make your rows eight feet afunder.

When you have planted your plants, if the ground is very dry, you fhould give them a little water, and then fet your glaffes over them, which may remain clofe down over them, until they have taken root, which will be in about a week or ten day's time, unlefs there fhould be a kindly fhower of rain; in which cafe you may fet off the glaffes, that the plants may receive the benefit of it; and in about ten days after planting, you fhould be provided with a parcel of forked fticks or bricks, with which you fhould raife your glaffes about three or four inches on the fide towards the fouth, that your plants may have free air: in this manner your glaffes fhould remain over the plants, night and day, unlefs in frofty weather, when you fhould fet them down as clofe as poffible: or if the weather fhould prove very warm, which many times happens in November, and fometimes in December; in this cafe, you fhould keep your glaffes off in the day time, and put them on only in the night, left, by keeping the glaffes over them too much, you fhould draw them into flower at that feafon; which is many times the cafe in mild winters, efpecially if unfkilfully managed.

Towards the latter end of February, if the weather proves mild, you fhould prepare another good fpot of ground, to remove fome of the plants into, from under the glaffes, which fhould be well dunged and trenched, as before; then fet off your glaffes, and, after making choice of one of the moft promifing plants under each glafs, which fhould remain for good, take away the other plant, by raifing it up with a trowel, &c. fo as to preferve as much earth to the root as poffible; but have a great regard to the plant that is to remain, not to difturb or prejudice its roots: then plant the plants which you have taken out, at the diftance before directed, viz. if for a full crop, three feet and an half, row from row; but if for ridges of cucumbers between them, eight feet, and two feet four inches diftance in the rows: then, with a fmall hoe, draw the earth up to the ftems of the plants which were left under the glaffes, taking great care not to let the earth fall into their hearts; and fet your glaffes over them again, raifing your props an inch or two higher than before, to give them more air, obferving to take them off whenever there may be fome gentle fhowers, which will greatly refrefh the plants.

In a little time after, if you find your plants grow fo faft as to fill the glaffes with their leaves, you fhould then flightly dig about the plants, and raife the ground about them in a bed broad enough for the glaffes to ftand, about four inches high, which will give your plants a great deal of room by raifing the glaffes fo much higher, when they are fet over them; and by this means they may be kept covered until April, which otherwife they could not, without prejudice to the leaves of the plants: and this is a great advantage to them; for many times we have returns of fevere frofts at the latter end of March, which prove very hurtful to thefe plants, if expofed thereto, efpecially after having been nurfed up under glaffes.

After you have finifhed your beds, you may fet your glaffes over your plants again, obferving to raife your props pretty high, efpecially if the weather be mild, that they may have free air to ftrengthen them, and in mild foft weather fet off your glaffes, as alfo in gentle fhowers of rain: and now you muft begin to harden them by degrees to endure the open air; however, it is advifable to let your glaffes remain over them as long as poffible, if the nights fhould be frofty, which will greatly forward your plants: but be fure do not let your glaffes remain in very hot fun-fhine, efpecially if their leaves prefs againft the fides of the glaffes; for I have often obferved, in fuch cafes, that the moifture which hath rifen from the ground, together with the perfpiration of the plants, which, by the glaffes remaining over them, hath been detained upon the leaves of the plants, and when the fun hath fhone hot upon the fides of the glaffes, hath acquired fuch a powerful heat from the beams thereof, as to fcald all their larger leaves, to the no fmall prejudice of the plants: nay, fometimes I have feen large quantities of plants fo affected therewith, as never to be worth any thing after.

If your plants have fucceeded well, towards the end of April fome of them will begin to fruit; you muft therefore look over them carefully every other day, and when you fee the flower plainly appear, you muft break down fome of the inner leaves over it to guard it from the fun, which would make the flower yellow and unfightly, if expofed thereto; and when you find your flower at its full bignefs, which you may know by its outfide parting, as if it would run, you muft then draw it out of the ground, and not cut them off, leaving the ftalk in the ground, as is by fome practifed; and if they are defigned for prefent ufe, you may cut them out of their leaves; but if defigned to keep, you fhould preferve their leaves about them, and put them into a cool place: the beft time for pulling them is in a morning, before the fun hath exhaled the moifture; for cauliflowers, pulled in the heat of the day, lofe that firmnefs which they naturally have, and become tough.

But to return to our fecond crop, the plants being raifed and managed as was directed for the early crop, until the end of October, you muft then prepare fome beds, either to be covered with glafs frames, or arched over with hoops, to be covered with mats, &c. Thefe beds fhould have fome dung laid at the bottom, about fix inches or a foot thick, according to the fize of your plants; for if they are fmall, the bed fhould be thicker of dung, to bring them forward; and *fo vice verfa*. This dung fhould be beat down clofe with a fork, in order to prevent the worms from finding their way through it; then lay fome good frefh earth about four or five inches thick thereon, in which you fhould plant your plants about two inches and a half fquare, obferving to fhade and water them until they have taken new

new root; but be ſure do not keep your coverings cloſe, for the warmth of the dung will occaſion a large damp in the bed, which, if pent in, will greatly injure the plants.

When your plants have taken root, you muſt give them as much free open air as poſſible, by keeping the glaſſes off in the day time, as much as the weather will permit; and in the night, or at ſuch times as the glaſſes require to be kept on, raiſe them up with props to let in freſh air, unleſs in froſty weather; at which time the glaſſes ſhould be covered with mats, ſtraw, or peaſe haulm, &c. but this is not to be done but in very hard froſts. You muſt alſo obſerve to guard them againſt great rain, which in winter time is very hurtful to them; but in mild weather, if the glaſſes are kept on, they ſhould be propped to admit freſh air; and if the under leaves grow yellow, and decay, be ſure to pick them off; for if the weather ſhould prove very bad in winter, ſo that you ſhould be obliged to keep them alſo covered for two or three days together, as it ſometimes happens, theſe decayed leaves will render the incloſed air very noxious; and the plants, perſpiring pretty much at that time, are often deſtroyed in vaſt quantities.

In the beginning of February, if the weather be mild, you muſt begin to harden your plants by degrees, that they may be prepared for tranſplantation. The ground where you intend to plant your cauliflowers out for good, which ſhould be quite open from trees, &c. and rather moiſt than dry, having been well dunged and dug, ſhould be ſown with radiſhes a week or a fortnight before you intend to plant your cauliflowers. The reaſon why I mention the ſowing of radiſhes particularly, is this, viz. that if there are not ſome radiſhes amongſt them, and the month of May ſhould prove hot and dry, as it ſometimes happens, the fly will ſeize your cauliflowers, and eat their leaves full of holes, to their prejudice, and ſometimes their deſtruction; whereas, if there are radiſhes upon the ſpot, the flies will take to them, and never meddle with the cauliflowers ſo long as they laſt. Indeed, the gardeners near London mix ſpinage with their radiſh-ſeed, and ſo have a double crop; which is an advantage where ground is dear, or where perſons are ſtraitened for room: otherwiſe it is very well to have only one crop amongſt the cauliflowers, that the ground may be cleared in time.

Your ground being ready, and the ſeaſon good, about the middle of February you may begin to plant your cauliflowers. The diſtance which is generally allowed by the gardeners near London (who plant other crops between their cauliflowers to ſucceed them, as cucumbers, for pickling, and winter cabbages) is every other row, four feet and a half a part, and the intermediate rows two feet and a half, and two feet ten inches diſtance in the rows; ſo that in the latter end of May, or the beginning of June, when the radiſhes and ſpinage are cleared off, they put in ſeeds of cucumbers for pickling, in the middle of the wide rows, at three feet and a half apart; and in the narrow rows, plant cabbages for winter uſe, at two feet two inches diſtance; ſo that theſe ſtand each of them exactly in the middle of the ſquare between four cauliflower plants, and theſe, after the cauliflowers are gone off, will have full room to grow, the crop, by that means, continuing in a ſucceſſion thro' the whole ſeaſon.

There are many people who are very fond of watering cauliflower plants in ſummer; but the gardeners near London have almoſt wholly laid aſide this practice, as finding a deal of trouble and charge to little purpoſe; for if the ground be ſo very dry, as not to produce tolerably good cauliflowers without water, it ſeldom happens, that watering of them renders them much better; and when once they have been watered, if it be not conſtantly continued, it had been much better for them if they had never had any; as alſo, if it be given them in the middle of the day, it rather helps to ſcald them; ſo that upon the whole, if care be taken to keep the earth looſe and drawn up to their ſtems, and every thing be cleared away that grows near them, that they may have a free open air, you will find that they will ſucceed better without than with water, where any of theſe cautions are not ſtrictly obſerved.

But in order to have a third crop of cauliflowers, you ſhould make a ſlender hot-bed in February, in which you ſhould ſow the ſeeds, covering them a quarter of an inch with light mould, and covering the bed with glaſs frames. When the plants are come up, and have gotten four or five leaves, you ſhould prepare another hot-bed to prick them into, at about two inches aſunder every way; and in the beginning of April harden them by degrees, to fit them for tranſplantation, which ſhould be done the middle of that month, at the diſtance directed for the ſecond crop, and muſt be managed accordingly. Theſe, if the ſoil be moiſt where they are planted, or the ſeaſon be cold and moiſt, will produce good cauliflowers about a month after the ſecond crop is gone, whereby their ſeaſon will be greatly prolonged.

There is alſo a fourth crop of cauliflowers, which is raiſed by ſowing the ſeed about the twenty-third of May; and being tranſplanted, as before directed, will produce good cauliflowers in a kindly ſeaſon and good ſoil, after Michaelmas, and continue through October and November, and, if the ſeaſon permit, often a great part of December. *Miller's Gard. Dict.*

CAUTERY, a name given to a red hot iron, uſed by farriers, to deſtroy fungous fleſh, &c.

CAUTING-IRON, an iron with which farriers ſear thoſe parts of a horſe that require burning.

CELERIAC, a ſpecies of celery which ſhould be ſown at two or three different times, in order to have, during the whole ſeaſon, a ſucceſſion of plants which do not run up to ſeed. The firſt ſowing may be in the beginning of March, in which caſe it ſhould be upon a gentle hot-bed, on account of the rawneſs of the weather at that ſeaſon. The ſecond may be at the end of the ſame month, in an open ſpot of fine rich moiſt and light earth, fully expoſed to the warmth of the ſun: and the third ſhould be by the latter end of April, or the beginning of May, likewiſe on a rich and moiſt ſoil, diſtant from the drip of trees. If this ground be expoſed to the morning ſun only, it will be ſo much the better. Theſe ſeeds muſt be watered frequently, if the weather be dry, for otherwiſe they will not grow; but with this care they will put forth plants in about three weeks or a month, and theſe will be fit to tranſplant in five or ſix weeks after their coming up.

When this is done, they ſhould be pricked out at the diſtance of three inches ſquare from one another, in well prepared, and warmly ſituated beds of moiſt rich earth; and if the ſeaſon ſhould prove cold, theſe beds muſt be covered with mats, to defend the young plants from the morning froſts, which would greatly check their growth, or, perhaps, even kill many of them. In drawing them out of the ſeed-bed, care ſhould be taken to thin them, where they grow too thick, and to leave the ſmalleſt to get more ſtrength before they are removed. By this means the ſame ſeed-bed will afford three different plantings, which will ſucceed each other for uſe.

By the middle of May, ſome of the firſt tranſplanted plants will be fit to remove again for blanching; and in this particular only the culture of celeriac differs from that of celery, the latter being tranſplanted into trenches, and there earthed up, whereas celeriac, which ſeldom grows above eight or ten inches high, and therefore requires but little earthing up, ſhould be planted in level ground, or in very ſhallow drills, its great excellency conſiſting in the ſize of its root, which often grows as big as an ordinary turnip, even in the common way of ſetting theſe plants only ſix or eight inches aſunder in rows, fixteen inches apart, and earthing them up but once. It is therefore highly reaſonable to think, that if the ſuperior method of culture uſed in the new huſbandry was applied to this plant, both the taſte and ſize of the roots would be greatly improved.

CELERY, or Celeri, the name of a well known plant, much uſed in ſoups, and other culinary uſes.

It requires exactly the ſame treatment as celeriac, laid down in the preceding article, till it is tranſplanted for the ſecond time, in order to be blanched. The uſual way of performing this, is to dig a trench by a line, about ten inches wide, and eight or nine inches deep, in a moiſt, rich, and light ſoil; and to looſen and lay level the earth at the bottom of this trench, and to throw up on each ſide a ridge of the mould taken out, that it may be in readineſs there for earthing the celery. Theſe trenches are generally three feet aſunder, which is a ſufficient ſpace for digging between them after they are filled up. When the young plants have been trimmed, and the tops of their longeſt

longeſt leaves cut off, they are ſet in one ſtrait row in the middle of the bottom of the trench, at about four or five inches diſtance from one another; their roots are then covered with mould trodden down cloſe to them; and care is taken to water them plentifully, till they have ſtruck out new roots. As theſe plants advance in height, freſh earth is drawn in cloſe to them on each ſide, but with great caution not to bury their hearts, or even to do this in wet weather, leſt it ſhould make them rot.

When the plants are grown conſiderably above the trenches, and all the ridges have been employed in earthing them up, a ſpade is uſed to dig up more earth from between their rows, and this is continued, at proper intervals of time, till they are fit for uſe.

The celery firſt planted out will be fit for uſe about the end of July. This will be ſucceeded by the after plantations; and the later ſowings, if rightly managed, will yield a conſtant ſupply of it till April. The laſt crop ſhould be planted in a drier ſoil than any of the preceding; and to prevent its being rotted by much wet in winter, it will be right to cover the ridges, eſpecially if there be any danger of hard froſt, with peas-haulm, or ſome other light covering, which will not ſmother the plants: for covering them too cloſe would alſo make them rot. However, this will be ſufficient to keep the froſt out of the ground, ſo that the celery may be taken up whenever it is wanted; which cannot be done when the earth around it is hard frozen. But this covering muſt be taken off as early in the ſpring as the weather will permit, leſt it ſhould make the plants run to ſeed.

Celery will not continue good above three weeks or a month after it is fully blanched, but will then grow hollow, or rot. A ſucceſſion of ſix or ſeven different plantings is therefore neceſſary for thoſe who would have a conſtant and regular ſupply.

CELLS, the ſmall diviſions in honey-combs, which, geometers have obſerved, to be always regular hexagons.

Cells, alſo denote the hollow places between the partitions in the pods, huſks, and other ſeed-veſſels of plants.

CENTAURY, the name of a weed abounding in arable lands, and generally called blue-bottle. *See* Blue-Bottle.

CERES, a pagan deity, the inventor, or goddeſs of corn.

CERT-MONEY, a fine paid yearly by the reſidents of ſeveral manors to the lord thereof, and ſometimes to the hundred, for the certain keeping of the leet.

CHAFF, the huſks of corn that are ſeparated by thraſhing and winnowing. *See the articles* Thrashing *and* Winnowing.

Chaff alſo ſignifies the rind of corn: thus, barley that has a thick rind is ſaid to be thick chaffed.

Chaff, likewiſe implies ſtraw, &c. cut ſmall, and given to horſes and other cattle, mixed with corn. *See the article* Cutting-Box.

CHALK, the Engliſh name of the white dry marl, with a duſky ſurface, found in hard maſſes.

Chalk is a laſting manure for ſuch lands as it agrees with, which are particularly thoſe of a cold ſour nature, and ſtiff untractable clays. Pliny tells us, it was the cuſtom of the ancient Britons to chalk their lands, by which they received a great and laſting improvement.

Farmers are apt not to diſtinguiſh ſufficiently between the different kinds of chalk. The hard, dry, and firm, is much the fitteſt for burning into lime; but the fat unctuous chalk is by far the beſt to be uſed crude. This oily, viſcous ſort of chalk, is uſed in many places inſtead of marl, to which it is nearly allied, though of an inferior quality. It is even called marl in the Iſle of Wight, where their chalk is of a remarkably fat ſoapy nature; and they ſometimes lay twenty-five waggon-loads of it upon an acre of ground. *Liſle's Huſbandry, vol.* I. *p.* 66.

A correſpondent of the editors of the Muſeum Ruſticum ſtrongly recommends chalk as a manure for clay lands; but adds, it ſhould be laid on rough, in large clods, whereby the land will gradually receive the greater benefit by it. The ſalts in the air will penetrate, and crumble the clods; and the land, on which the chalk is laid, will ſoon be brought into a ſtate of fermentation, reduced and pulverized in a ſpecial manner, inſomuch, that afterwards, one ploughing will go as far towards bringing it into tilth as two before.

The quantity of chalk ſhould be proportioned to the ſtubbornneſs of the ſoil; from fifteen to thirty tumbril-loads on an acre.

The virtues of this manure are not exhauſted under, at leaſt, twenty years; nor are they much perceived till the third year; but for twelve or fourteen years the farmer will have reaſon to thank thoſe who adviſed him to the ſtep of chalking his clay lands: and happy is he who can afford to do it, provided he has a long leaſe; for lands not worth five ſhillings an acre have, by this means been, in a year or two, worth twenty. *Muſeum Ruſticum, vol.* II. *p.* 305.

An old experienced farmer in the hundreds of Eſſex has, in the ſame work, given an excellent account of the benefits reſulting from chalk laid on clay lands, where, he juſtly obſerves, it inſinuates itſelf into the ſmall pores, and, raiſing a fermentation, expoſes the clay more to the operations of the froſts, rain, ſun, and air, by which means its too coherent particles are looſened, and it is reduced to a ſtate of pulverization.

" We all know, adds this intelligent huſbandman, that clay, when reduced, either by fermentation or attrition, into ſmall and minute particles, is an excellent ſoil for affording plenty of nouriſhment to almoſt every kind of vegetable: it is therefore natural to us, when poſſeſſed of a ſtiff clay, to go in ſearch of means for producing theſe deſirable effects.

" Chalk has been long allowed the palm in this reſpect: our anceſtors, the ancient Britons, uſed it with great ſucceſs; and the practice, as warranted by conſtant experience, has been handed down to the preſent age: is it not then a pity but a cuſtom ſo profitable ſhould not be made known to every part of his majeſty's dominions?

" The chalk we uſe in Eſſex is moſtly brought from Kent: it agrees well with our clays, and many fine fortunes have been made in this country by chalking farms: yet what may appear very ſtrange, but is not leſs true, this ſame chalk, when laid on the clayey lands in Kent near the pits, does by no means anſwer the farmer's expectation.

" It has been a common ſaying among farmers, that chalk laſts only for a certain number of years, after which it leaves the land in a worſe ſtate than that in which it found it: but this is probably a miſtake, owing to prejudice, negligence, or ignorance.

" When land has been chalked, under a notion it cannot be hurt by cropping, they generally keep it in almoſt conſtant tillage, and it pays well for the ploughings; but then the ſoil being, by ſuch conſtant working, reduced to a pulverized ſtate, the chalk eſcapes through the now-enlarged pores of the clay, and forms a cruſt under the looſe ſtratum on the ſurface of the hard clay beneath, being waſhed down by the rains.

" The particles of clay, being now deprived of their coatings of chalk, adhere one to the other, enlarge their ſurfaces, and become at length a coherent maſs of ſtiff ſoil, like what it was before the land was chalked at all, not worſe in quality, but nearly in the ſame ſtate. Probably the chief reaſon which induces farmers to think the land impoveriſhed by chalk is, becauſe they have, whilſt the manure acted with its full vigour, been for many years uſed to great crops, forgetting, or perhaps never knowing, what crops the land yielded before any chalk was laid on it.

" A great deal of care is requiſite in land after it is freſh chalked: if the large lumps are buried before they are ſtrongly impregnated with the influences of the atmoſphere, they will lie under ground undiſſolved, in a hard maſs, for a great number of years, without benefiting the land in the leaſt. For this reaſon, the farmer muſt not be in a hurry to bury his chalk: in fact, the longer it lies above ground the better, as it will then gradually be reduced into an impalpable powder, which, being mixed and incorporated with the clay, leſſens the coheſion of its parts, enlarges its pores, and diſpoſes it to yield that nouriſhment to vegetables, which, in its natural ſtate, it is too retentive of.

"Clay is, by nature, poffeffed of a large ftock of the food, whatever it be, which plants moft delight in; but it is a ftubborn foil, and will not, till compelled to it by fome extraneous caufe, give forth any of its riches. If it is pulverized by the inftruments of hufbandry which act by attrition, it becomes a proper bed for the reception of the roots of vegetables; but this pulverization is not to be effected without great expence of time and trouble: and it was the difficulty of this operation that induced our anceftors to fearch for fome eafier and fhorter method for reducing the folid particles of clay; they effected it by means of fermentation, and this fermentation was raifed, for the moft part, by rotten horfe-dung.

"When this manure became fcarce, and difficult to be procured, it was neceffary to have recourfe to fome other remedy to correct ftiff foils. Chalk was found well adapted to the purpofe: the ufe of it was after many years almoft univerfally adopted, and experience has now, for many ages, juftified the practice.

"It has been already obferved, that chalk improves clay, not by adding to it any vegetative quality, but by mixing intimately with its fubftance, and leffening the cohefion of its parts.

"Let us by way of illuftration, fuppofe any given quantity of clay mixed and incorporated with a proper proportion of chalk, it will be found that the clay will poffefs a degree of lightnefs, which nature has denied it. Let this mixed earth be fpread on a floor expofed to the weather in winter time; let it be frequently fprinkled with water, and be ftirred about feveral times a day for fome months: on an examination, it will then be found, that the chalk has fubfided, and the clay become more compact than it was, but not fo compact as it was before any chalk was mixed with it.

"The fubfided chalk will form a complete ftratum under the bed of clay.

"I have been the more particular in this account, becaufe on the principle of fubfidence I have founded a practice, which I have experienced to be profitable to myfelf, and therefore I think it not totally improper to be recommended to the notice of others.

"I had heard it long complained of, that the benefit refulting from chalk ceafed after a courfe of years. I always thought, and indeed found, that the chalk fubfided: this made me form an opinion that the chalk, even after it had fubfided, might, in part at leaft, be retrieved; for the earth, which had been loofened to a certain depth, was, at the bottom of the loofe mould, a hard compact body, which the chalk could not penetrate: here therefore it muft, of courfe, reft in its fubfidence, forming a thin coat on this hard body.

"About forty years ago I chalked the greater part of my farm in the manner prefcribed by the cuftom of this country. For about fourteen years I enjoyed very good crops; but at the end of that time they began to fail a little. As neceffity is the mother of invention, I came to a refolution of trying an experiment on a field of twenty acres: accordingly, when the time came in which it was to receive a whole year's fallow for a crop of wheat, I caufed the whole of it, foon after harveft, to be ploughed twice in a place, one plough following another in the fame furrow.

"By thefe means I turned up an entire new earth, on which I immediately laid in the proportion of about three loads of chalk an acre, fuffering it to lie rough all the winter.

"In the fpring I gave it a fecond ploughing, and beftowed on it three more ploughings before Chriftmas, when I again left it rough for the winter.

"I muft not, however, fail obferving, that in all the ploughings after the firft, the fhare went only the ordinary depth.

"In the fecond fpring I raifed as fine a mould as I could, by various operations, and fowed the field with barley, of which I had, at harveft, a crop to my entire fatisfaction: my next crop was wheat, on which I fprinkled fome clover-feed, which brought the land into the ufual courfe of hufbandry.

"The reafon why my land begins to fail, in about fourteen years after chalking is, becaufe I allow more ploughings to each crop than any of my neighbours, and thefe frequent ftirrings caufe the calk, as I imagine, to fubfide fooner.

"My method anfwered fo well, that I managed all my chalked land in the fame manner with good fuccefs; and had, in confequence, a fucceffion of good crops for ten years more.

"When the ten years were expired, I gave my land another trench-ploughing, which never failing to recover the chalk, I renew it at regular intervals, but lay no frefh chalk on it after the firft trench-ploughing, being in all the reft content with what is already in the land.

"This method has ftood the teft of many years experience, and I have not the leaft reafon to afcribe it to any thing peculiar in the quality of my foil: why, therefore, fhould it not fucceed as well with others as it has done with me?

"Let me perfuade fuch of your readers, as it may any ways fuit, to make the experiment; it cannot be any great expence, and the refult may turn out very greatly to their advantage.

"This doctrine of the fubfidence of chalk is certainly founded on reafon: the predominant natural foil will always precipitate that which is only adventitious, and in fmaller quantity; for the fame obfervation holds good when clay is laid on chalk.

"This fubfidence may alfo be obferved when clay is laid on fand, or fand on clay, as a manure; and might, perhaps, be extended to many other articles, fo as to be deemed a general principle.

"Few know the benefits refulting, on fome occafions, from deep ploughing: but in this, as well as in every other matter, difcretion is to be the grand guide; and I would, by all means, advife the farmer to examine into the depth of his foil, by remarking what is thrown out of his ditches, or by the help of a borer. Let him judge by this, and he cannot well go aftray.

"I muft alfo give another caution to my honeft brethren the farmers, which is, not to be in too great a hurry to crop a field after it has had a trench-ploughing; for the foil turned up from any confiderable depth will be fomewhat crude in its nature, till it is meliorated by the influences of the fun and air.

"I have generally found that one whole year's fallow is fufficient to effect this; but two winters and a fummer I never knew to fail: it is chiefly froft which contributes to pulverize the chalk, and fweeten the foil; not but that it receives great benefit from the rain and funfhine, and particularly from fnow, which is ftrongly impregnated with nitrous particles; all I mean to infinuate is, that one day's froft, contributes more to fweeten a ftiff, rough, foil, than two day's funfhine, rain, or fnow.

"Let me in this place hazard a conjecture, which may, however, prove a fact: the reafon why froft fo much contributes to difunite the particles of clay may be owing to its fwelling the clods, and increafing their furface: the cavities occafioned by this fwelling are filled with ice: when a thaw comes on, wherever the ice was, is a vacuum, and the particles of which the clay is compofed, being feparated one from the other, crumble and fall in pieces: when they are in this ftate, and the land has been chalked, a fingle ploughing, well-timed, will cover their furfaces with the chalk-powder, and prevent them from fpeedily adhering one to the other.

"Your readers, who have been in countries where there are quarries of ftone, muft have obferved, that, whilft in the quarry, it works better than after it has been expofed to the fun; for it hardens confiderably after it has been out of the quarry fome time. It is the fame with chalk, which is apt to be hardened by lying a fummer in the fun: for this reafon, it is advifable, that the chalk intended for manure fhould be dug as foon as the winter fets in, and laid prefently on the land. This method and time of chalking may occafion fome increafe in the expence; but the farmer will be well paid for it in the end, and he will, by this management, fooner reap the benefit of his labours.

"Let it not be imagined from any thing I have faid here, that I truft folely to chalk for bringing me good crops; no, I always beftow, once in a courfe of three or four years, a reasonable coat of compost dung. I do not lay on the chalk with any intention that it should enrich the clay: my desire is, that it should bring it to the nature of a loam, as the dung will then take effect, and ensure the farmer a large crop, provided he guards himself against the depredations of weeds, which are too apt to have their seeds mixed with the dung made of long straw, and often grow faster than the corn, with which the land should be cropped. Dung, when prudently applied, is, like many other things, of great use; but it is dangerous in the hands of an ignorant land-holder. The expence of procuring it in quantity will ruin him, and his crops will go near to be choaked by the encroaching weeds." *Museum Rusticum, vol.* III. *page* 198.

"If chalk, says Mr. Lisle, be laid on clay, it will in time be lost, and the ground again return to its clay; and if the clay be laid on chalk, in time the clay will be lost, and the ground return again to its chalky substance. Many people think the land, on which the other is laid for a manure, being predominant, converts the manure into its own soil; but I conceive, in both cases, the chalk and clay is filtrated through the land, on which it is laid, by time, and, being soluble by rains into small corpuscles, is washed through the land on which it is laid; for neither of these manures is able to unite, in its finest corpuscles with the corpuscles of the land on which it is laid, so as to form so strict an union and texture with it as the land doth with itself, and is therefore liable to be borne downwards with rains, till no sign of it be left.

"It is said to be a common practice with many tenants in Hampshire, three or four years before they leave their farms, to chalk their meadows; by which means they will for three or four years fling out a great crop of grass, but that they will be much the worse for it ever after. This seems to carry some reason with it; for the chalk so mellows and opens the pores of the meadow, that it enables the land to exhaust its strength in all parts: for chalk does not carry so much fatness as dung does to the land it is laid on; but it disposes the land to bear such crops by its sweetness, and well disposing of, and correcting an ill quality the land had before: but still I do not see that this is any objection to the chalking of meadows, provided, whilst, by virtue of the chalk, they are bearing such burthens, you take care to refresh them with dung.

"Though chalk laid on meadows enables them to give a great crop for three or four years, and will then impoverish them, yet I take it to hold quite contrary in pasture; for the grass being thereby so much sweetened and increased, keeps constantly so much the more stock, by which it is maintained always in the same vigour.

"It is probable, that chalk spread on sandy, or woodseary ground, laid up for pasture, may wash and sink in, and fill up the interstices, and thereby consolidate and mend the texture of such ground, and sweeten it, as it is a great alkali; and though in time most of the chalk may be washed downwards, so that the ground may lose its virtue, yet I do suppose the strength of the ground may still continue much better, by reason that such manure having made the sward of the grass come thicker and sweeter, the good pasturage on both accounts enlarges the quantity, and betters the quality of the dung the cattle leave on it, which, in return, maintains a better coat and surface to the ground: and as chalk fills up the vacuities of sandy, or wood-seary ground, so, on the contrary, it insinuates its particles into obstinate clayey and strong land, and divides it, by making in a manner, a scissure, thereby hollowing and mellowing it; so that the two contrary extremes are cured by chalk.

Chalk laid on hop-clover and rye-grass is a mighty sweetener and improver of these grasses, being laid upon it after harvest, at the beginning of winter, or whensoever one can best tend it; the benefit will be soon conspicuous, especially if the ground be a sour clay, and apt to run to coarse grass. *Lisle's Husbandry, vol.* I. *p.* 66.

CHALKEY *Lands*, are those which are impregnated with chalk, and from their white colour, are in some counties, called white lands.

The best produce of corn in chalky lands, is barley and wheat; oats will do well on them. Their natural produce for weeds is poppies, May-weed, &c. For grass-feed, saintfoin, trefoil, and, if rich, clover. The best manure for these lands is rags, dung, folding of sheep, &c. These land, if rain happens to fall on them just after sowing, before the corn gets up, will cause the earth to bind so hard, that the corn cannot get through it; but may be much helped by a light harrowing.

In Hertfordshire they manage these lands for corn in the same manner as they do their clay lands. In Oxfordshire they commonly manure these lands with half rotten dung, which, they say, prevents the binding of it, and some mix it with sand, which causes it to work short, especially if any thing dry; they commonly sow them there with wheat, missen, and barley; only after wheat they sow pease or vetches: in the sowing of which they are obliged particularly to take care to have fine weather, because of the land's binding; but if they have only two nights dry weather, they will do well enough. *Mortimer's Husbandry, vol.* I. *pag.* 68.

CHAMOMILE, a very common plant, growing wild upon commons and other waste lands in many parts of England, particularly in moist and shady places, which it most delights in.

It is a trailing perennial plant, which puts forth roots from the joints of its branches as they lie on the ground, and by that means spreads and multiplies exceedingly; so that whoever would cultivate it, need only procure a few slips of it in the spring, and plant them about a foot asunder, that they may have room to spread; they will soon cover the ground.

Chamomile walks were formerly a sort of fashion in gardens; and indeed they looked pretty enough for some time after they were mowed and rolled: but they are now entirely out of use, because this plant is very apt to decay in large patches, which then become disagreeable to the eye.

The chamomile flowers for medicinal uses should be of the single kind; but the market people generally sell the double, because they are the largest.

The double flowered sort of chamomile is as hardy as the single, and may be propagated in the same manner.

CHANFRIN, the fore-part of a horse's head from one hand to the other.

CHANGE *of crops*, a very judicious part of husbandry, consisting in a change of different species of grain on the same soil.

Experience soon taught men, that even the most fruitful soil cannot constantly yield the same grain; and this of course laid them under a necessity of seeking for means to remedy the defect. They found the plough the most ready, and perhaps the most effectual: and hence all the ancient writers so highly commend a thorough ploughing. At the same time the apparent loss of the produce of the ground during the year of fallow, put them upon enquiring how this inconvenience might be prevented, consistently with keeping the land in good heart. Repeated observations convinced the Romans, the most attentive of all nations to every thing relative to husbandry, that, besides the alternate resting of the land, wheat may, as Pliny observes, be sown after lupines, vetches, beans, or any other plant which has the quality of fertilizing and enriching the soil. This, says Mr. Lisle, deserves to be well noticed, because our farmers imagine they cannot make their rent, if they pay twelve shillings an acre, without sowing their land every year; nor will they be persuaded to lay it down to grass.

The most rational change of crops hitherto pointed out by any writer, is the following, planned by Camillo Tarello, and which he presented to the senate of Venice in the year 1566.

"Let the ploughings hitherto given to corn land divided into two portions (each of which being rested every alternate year, receives four ploughings that year) be transferred to the half of one of those portions, so that it be ploughed eight times, including the seed ploughing; I mean, that every farm in tillage be divided into four equal parts, and that only one of these parts, taking them alternately, be fowed with corn in any one year, after it has been ploughed eight times. Two of the other parts fhould be laid down to grafs; and the fourth fhould be fallowed a year, during which it fhould receive the above-mentioned number of ploughings.

" He, therefore, who has now, for example, ten acres under corn, fhould for the future fow only five, and fo in proportion for a larger or leffer extent; and all the manure and labour formerly beftowed upon his ten acres fhould be appropriated to the five only; that is, he fhould plough them eight times, unlefs the foil be extremely light.

" The hufbandman fhould begin to plough in October or November, about ten months before he fows, or fooner if he can; but always in dry weather. He fhould lay on his dung before the laft ploughing; and fhould not fow more than two thirds of the quantity of feed hitherto commonly ufed, and that feed fhould be of the growth of the country.

" Whoever follows this method may always depend upon reaping the following advantages:

" 1. This way of cultivating land leffens the expence and labour; it being eafier to plough one acre eight times, than to plough two acres four times each: becaufe, after the third time, an acre and a half, at leaft, may be ploughed as foon as an acre could have been before; and if he begins his work in October or November, while the land is in good condition for ploughing, he may continue it the following year, at fuch times as he will have little more urgent bufinefs, fo as to have four ploughings done about the end of May. By this means the four fummer ploughings will not require fuch ftrong ploughs as fome people now ufe, to the great hurt of their cattle, and fatigue of the ploughman, becaufe the ground will be already well loofened.

" 2. Thefe repeated ploughings will deftroy the feeds and roots of weeds, which rob the corn of its food, choak it, and hinder it from growing.

" 3. A field refted, and then prepared in this manner, will yield more than double the produce of two equal fpaces of land cultivated in the common manner, as I have often experienced. This is more than doubling one's income.

" 4. Over and above this great advantage, we likewife fave two thirds of the quantity of feed hitherto commonly ufed: for, by fowing only a quarter inftead of half of the land in tillage, there is an immediate faving of half the feed formerly required; and by fowing only two thirds of the ufual quantity upon that quarter, we again fave two twelfths, that is one fixth of all the former feed: now half and one fixth makes two thirds, to be deducted from the former ufual quantity.

" 5. We fhall have a fufficiency of ftraw of every kind for all our ufes, efpecially for litter and dung, fo indifpenfably ufeful.

" 6. We fhall have hay and fodder enough to keep many cattle; becaufe we may, and fhould fow one half of our ground with graffes, which will thrive extremely well, while the land is thus refted for two years, in order to be afterwards broken up, ploughed, and fowed with corn in its turn: for I again advife fowing only a quarter part of the whole farm with corn, and breaking up another quarter immediately after feed-time, before winter: and, on the contrary, neither of the other quarters fhould be ploughed during two years. But as the earth is deftined continually to yield productions of one kind or another, even while it refts, we fhall do well in following the path pointed out by nature, by helping it to produce clover, and other plants fit for fodder, which are of fingular fervice to us, not only on account of the hay we reap from them, but alfo becaufe their roots greatly improve the foil. In the country about Brefcia, plentiful crops of the fineft flax are reaped from fields where a quantity of clover has been lately mowed; and lands are let there for a great price, not only becaufe the foil is rich, and can be watered, but alfo becaufe it has juft been under clover. If fuch value is fet upon land intended only for flax or millet, how much more would good wheat land juftly deferve?

" 7. A feventh advantage will be, that land refted regularly for two years (I fay, with Virgil, that it refts when it is not ploughed) being well conditioned, afterwards well prepared, ploughed, enriched by the roots of the graffes, and kept clear of weeds, will yield crops more than twice as great as any we now reap; a truth which I have practically experienced, which the moft fenfible and moft judicious hufbandmen that ever lived have long told us, and of which a trial will foon convince the moft incredulous.

" 8. One of the moft confiderable advantages attending this method, is the eafe with which a great number of cattle may be reared, by means of the increafed quantity of hay and green fodder. We fhall confequently have more horfes, more oxen, more cows, more fheep, and more poultry. Every one knows of what infinite fervice all thefe are, to feed us, to cloath us, and to help us in our work. He, therefore, who has hitherto been obliged to have two yoke of oxen will, in this method, want only one, and may, inftead of the other, feed two or three cows: for as the labour is hereby leffened, and the quantity of good fodder increafed, two oxen will be fufficient to plough the land, efpecially as the foil will, by thefe means, be brought daily into better and better tilth.

" 9. From hence naturally arifes a ninth advantage, which is, the quantity of manure produced by the increafe of cattle and of fodder; an advantage which no good hufbandman will neglect to purchafe, if the means of doing it are but pointed out to him.

" The 10th and laft of the advantages which I fhall here enumerate, as refulting from this new method of culture, is, that poor and barren lands are hereby rendered, by degrees, good and fertile: for fuch is the conftitution of the earth, that ploughing and manuring alter its very nature, and improve it more and more, as experience repeatedly demonftrates. Valerius Maximus inftances the ftriking example of Mafiniffa, king of Numidia, who made agriculture flourifh fo much, that he left his country, which he found barren and defolate, ftored with riches and every good thing. It is in our power to do the fame. On the contrary, it is not lefs true, that even though the earth be rich and good, it will yield but little fruit, if it be not well cultivated; refembling therein the capacity of the human mind, which, according to Cicero's fine comparifon, is enlarged only by ftudy and exercife. Induftrious labour will not only procure us the neceffaries, nay, the fuperfluities of life, but will even change a barren country into a kind of garden. *Ricordo d'Agricultura di Tarello.*

M. Duhamel, after obferving that the French farmers, in general, change their crops, not on any principle dictated by reafon, but merely becaufe it was the cuftom of their forefathers, or they themfelves perhaps have occafion for fome particular growth, draws a parallel between the practice of dividing arable land into three parts, or into two, in order to their being alternately fown, and refted. " I have, fays he, fome acquaintance with the methods of practice in Guienne, and in part of Normandy; and am obliged to M. le Baron de Sournia, governor of Querebus, for enabling me to give an account of the methods ufed in the neighbourhood of Perpignan, where his eftate lies.

" In this hot climate they fow their lands in September, and begin to cut wheat about the twelfth of June; fo that their harveft is generally finifhed by Midfummer.

" They divide their lands into two portions only; fo that in one year they fow wheat, and the other the land fhould be fuffered to reft. But, on fuch part of their lands as are moft valued, they have feveral crops during the year of reft: this impoverifhes their lands, and they are obliged to fow their wheat too late, which leffens the crop. We fhall mention an inftance given by M. Sournia.

" In land they can water, they fow clover immediately after wheat-harveft, fcattering the clover-feed among the ftubble. The land is then immediately watered, and is afterwards feveral times repeated during the fummer: in the winter they feed it with fheep and lambs. Such as have no flocks fell their pafture to the upland farmers, who have flocks, but no winter fodder, their land being covered with fnow: this pafture therefore fetches a very high price.

" In

"In fpring, when the green fodder has been eaten down by cattle, they water the land, and by that means the clover fprouts apace; when it is in bloffom they mow it, make it into hay, and lay it up with the reft.

"Immediately after this crop, they dung the land; and fuch as are not afraid of exhaufting it, plough it, and fow either kidney-beans, or fmall millet: but as they cannot plough for wheat till thefe crops are off the ground, there is not time fufficient for giving the land proper tillage; the fowing is retarded, and the rich particles of the dung are partly confumed by thefe crops, while the manure might be more ufefully employed on lands they cannot water. M. de Sournia is, by repeated experience, convinced, that, to have good crops of wheat, they muft be contented with the crop of clover, and only fow kidney-beans, millet, &c. in fmall quantities for the ufe of the family.

"In Guienne, as well as in Anjoumois, they raife a crop of maize, which is a great impoverifher of the ground, during the year of fallow.

"The good hufbandmen alfo think, that in the rich lands, which they cannot water, it is beft, in a farm of three hundred acres, to be content with having one hundred and fifty acres of wheat, and to be careful to give proper tillage to the one hundred and fifty acres that fhould be in fallow, to make them proper for the reception of wheat. This is alfo the practice of fome diftricts of Normandy, where the climate being colder, and the foil more backward, they have fcarcely an opportunity of having any crop but wheat. However, when the land has been well dunged and tilled for maize, as they beftow three ploughings on that plant, there is commonly the next year a very good crop of wheat.

"It is evident, that by dividing a farm, that has three hundred acres in tillage, into two equal portions, which are fown alternately every other year, the tenant, during a nine years leafe, will reap one thoufand three hundred and fifty acres of wheat: whereas, if the land be divided into three portions, it will amount to nine hundred acres only. But, in the latter cafe, the former has nine hundred acres of fpring corn, which being eftimated at half the value of the wheat, make it juft equal to one thoufand three hundred and fifty acres of wheat. It follows therefore, that in grazing countries, where they plough with oxen, and ufe but few oats, it is moft advantageous to divide the land into two portions; but that this is not to be done in farms that are tilled with horfes, becaufe the neceffary purchafe of oats would amount to the value of the four hundred and fifty acres of wheat extraordinary.

"The farmers about Bayeux, in Lower Normandy, have two methods of changing their crops.

"According to one of thofe methods, 1. They fow buck-wheat towards the end of June; 2. When the roots and ftems of this plant are dead and withered, which is about All-faints day, they plough, and immediately fow wheat: the wheat is therefore fown on one fingle furrow. Thefe lands have indeed been ploughed for buck-wheat, and even thoroughly dunged; and plenty of manure can fupply the place of good tillage, and the latter can fupply the place of the former. 3. After reaping the wheat, they plough in the ftubble as foon as poffible; and, after giving the land a fecond ploughing in February or March, they fow it with oats; or a third ploughing is beftowed upon it, in order to crop it with barley: 4. They plough in the barley ftubble in winter, and after giving the land one fpring ploughing, fow either peas or tares: 5. Immediately after this crop is off, they turn down the land, that it may receive two ploughings before October, when it is fowed with wheat. 6. The following year they fow oats mixed with a little clover-feed; after which it is laid down in pafture for three or four years. It would be needlefs to mention that the farmer varies the order of his fucceffive crops, according to the nature of the foil, and his own occafions; but by this method, fix crops are reaped in fix years; two of wheat, two of oats, one of buck-wheat, and one of peas or turnips; and the field is then left in clover to be fed for four years.

"According to the other method, they fow no buck-wheat on the land they break up; it is left in fallow from February or March, when it is turned up, till October; and during this interval they manure it, and give it feveral ploughings to prepare it for wheat. In this cafe the crop is generally more plentiful, than when buck-wheat has been fown. In other refpects, the change of crops is the fame as was mentioned before." *Culture des Terres, tom.* VI. *p.* 34.

The changing of crops, upon rational principles, though of infinite confequence in agriculture, feems to have been neglected, and even forgotten, after the time of the ancient Romans, till Camillo Tarello pointed out its great importance, as we have already obferved in this article: nor do we, fince him, find much attention paid to this effential part of hufbandry, till very lately, when the culture of turnips probably gave the ufeful hint; the farmer obferving, that his land, inftead of being impoverifhed by that root, was enriched, and prepared to yield a better crop of barley in the fpring. This might naturally fuggeft to him, that other fucculent plants, which cover the earth with their leaves, might have the fame effect. The fuccefs has anfwered his utmoft expectation: for it is now found that a fallow does not become neceffary in feveral years; the ground being kept in heart by a variety of crops when rightly timed, and properly managed. The Society for the Improvement of Agriculture in Scotland, from whom we fhall borrow the following judicious inftructions, have the honour of fetting this difcovery in its proper light.

They obferve, "That fome crops, as peas, beans, clover, and all plants of the pulfe kind, are enrichers and cleaners of the earth; while wheat, oats, barley, and the whole tribe of vegetables, whofe roots are fibrous, and fpread far, impoverifh and rob the ground. The latter are alfo foulers of it, by giving way to weeds and grafs, which, being the natural product of every foil, are more readily nourifhed by it, than any plant which it does not fpontaneoufly produce; and if the earth be fed with any fort of manure, it will, while the weeds and grafs remain undeftroyed, like a tender mother, cherifh and nourifh them in proportion to the food fhe receives.

"Wheat and oats are great robbers of foils. Wheat remains a long time in the ground, during which the land untils itfelf, coalefces, and becomes of the nature of uncultivated earth; while the weeds, meeting with no oppofition, ripen, and fhed their feeds. Oats do not continue fo long: but they bind the foil by their ftrong roots, and give many weeds time to ripen. Barley, as it ftands only a few months, and feveral ploughings are given for it, binds the earth lefs than either wheat or oats. Peas, beans, tares, &c. are fuppofed to draw much of their nourifhment from the atmofphere, and that in proportion to the fucculency of their ftems and leaves, whereby it is probable their roots difcharge a moifture under ground; and their leaves, covering the furface of the earth, return the moifture and dews defcending through them, which mellow and rot them into a kind of manure." *Maxwell's Collection, p.* 219.

From the above obfervations, the farmer will be able to vary his crops in fuch a manner as always to keep his ground in heart, and free from weeds; particulars which cannot fail of producing very great advantages.

CHANNEL, of a horfe, is the hollow between the two bars of the under jaw bone, in which the tongue is lodged.

CHARCOAL, a fort of fuel, confifting of wood charred, or half burnt.

The duft of charcoal has been found, by repeated experience, to be of great benefit to land, efpecially to fuch as is ftiff and four. It is to be ufed in the fame manner as foot and wood-afhes. *See the articles* ASHES *and* SOOT.

CHARDS *of artichokes*, the leaves of artichoke plants, tied and wrapped up in ftraw, except the top, during the autumn

autumn and winter; by which means they will be blanched, and lose great part of their bitterness.

CHARDS *of beets*, are white beets covered over with dry dung, during the winter-season, when they will produce large tops, with a downy cotton shoot, which is the true chard, used in broths, &c.

CHARLOCK, called also *Chadlock*, *Catlock*, *Carlock*, and *White-Rape*, is a weed too generally known to need a particular description, the figure we have given of it on Plate V. Fig. 32. will be abundantly sufficient. Almost the whole plant is covered with bent pellucid hairs.

There are two sorts of charlock, one bearing white, and the other yellow flowers, but they seem to be only varieties of the same plant. The young plants of charlock so nearly resemble those of turnips, that they are not easily distinguished but by the taste; the charlock being hot and bitter, and the turnip mild. Farmers should therefore be very careful in weeding their turnips, lest they mistake them for charlock.

Mr. Lisle observes, that cold wet lands are always more subject to charlock than white or chalky lands; because the charlock-seed being very oily, resists putrefaction, and is not easily opened or penetrated by moisture, whereas white and light earth is soon dry after rain, and the water does not continue long enough on it to make such seed germinate so effectually as in the other. By an experiment which he made in sowing charlock-seed and turnip-seed at the same time, he found that the turnips will appear in three days, but the charlock in not less than ten. A hint that may prove very useful to the husbandman. *Lisle's Husbandry, vol.* II. *pag.* 297.

Mr. Mortimer, after remarking that both the white and yellow charlock are very prejudicial to corn, and that some lands are very subject to it, especially if manured with cow-dung alone, which he thinks increases it more than any other manure, unless it be mixed with horse-dung, or some other hot manure, mentions his being told that a person who had vast quantities of this weed in a field of barley, mowed the whole when the charlock was in flower, and ready to seed, which is commonly about the middle of May, as low as he could, without taking off more than just the tops of the blades of the barley; and that this gave the corn an opportunity to get above it, in such a manner, that he had four quarters of barley on an acre. He adds, that where a fallow is full of charlock, it will be right to turn in sheep, which will eat it very readily. *Mortimer's Husbandry, vol.* I. *p.* 311.

CHASE, a word used in some counties to signify a row or rank. Thus in the planting of quicksets, a single chase implies a single row; a double chase, means another row planted below the first, not immediately underneath the upper plants, but under the middle of the intermediate spaces. *Lisle's Husbandry, vol.* II. *pag.* 405.

CHATS, the keys of trees, such as the ash, sycomore, &c.

CHEDDER-CHEESE, a name given to a very large kind of cheese made at Chedder, a village near Mendip-hills in Somersetshire, famous for its pastures. It is common in this place for three or four dairies to join their milk, to make one great cheese, which generally weighs from one hundred and fifty to two hundred weight; and which they often sell at six-pence per pound on the spot.

CHEESE, a well-known species of food, prepared from curdled milk, pressed from the whey, and afterwards dried for use. *See the article* DAIRY.

CHEESE-LIP, a bag in which the dairy-women prepare and keep their runnet for making cheese. *See* RUNNET.

CHEESE-PRESS, a press used in dairies for squeezing the whey out of the cheese, We have given a drawing of the common cheese-press, on Plate VI. Fig. 1. where AB is the press, C E, and F G, are levers moveable about the points D, E, F, G, by applying the hand at C; S is the stone or weight; and H the cheese to be pressed.

CHEESE-RENNET. *See* YELLOW LADIES BED-STRAW.

CHERRY-TREE, the name of a well-known genus of fruit-trees, and of which there are several species, cultivated in gardens and orchards.

The cherry-tree, it is said, is a native of Pontus, a province of Asia Minor, from whence it was brought into Italy by Lucullus, the Roman, Anno Rom. 680; and about one hundred years after was introduced into England, where there are various sorts cultivated at present, such as the Flemish-cherry, Kentish-cherry, May-duke, arch-duke, red-heart, white-heart, black-heart, amber-heart, ox-heart, bleeding-heart, carnation, morello, and some others.

The several sorts of cherries are propagated by budding or grafting the different kinds into stocks of the black or wild red cherries, they being supposed to be of longer duration than the garden sorts.

Cherry-trees are raised in great quantities in the nursery gardens, both standards and dwarfs: the standards for planting orchards, particularly in Kent, where there are large plantations. The usual distance allowed for their standing is about forty feet each way. These standard trees should be planted in a situation defended as much as possible from the east and western winds; the one being likely to destroy their blossoms in the spring, and the other by its violence is very apt to break their tender branches: this occasions their gumming, and is very prejudicial to them. The sorts best approved of for an orchard are the Kentish, Flemish, duke, and common red cherry.

Cherry-trees may also be planted against walls in any exposure: the May-duke being generally planted against a south aspected wall, though it is not amiss to have some against a north wall, which will continue their season the longer; and the same may be done with the other sorts. The morello-cherry is generally planted against walls fronting the north. This fruit is commonly used in preserving: yet where they are planted to a better aspect, and suffered to hang on the trees till they are thoroughly ripe, they are not a bad fruit for the table; for by long hanging, it loses most of its acidity or sourness.

The less cherries are pruned, the better they like it; but, however, where weak or luxuriant branches happen, they must be governed by the knife. When cherry-trees take to bearing very early, and grow but little, it is best to pull off most of the bloom, and shorten the branches, which will cause the tree to shoot with fresh vigour.

The black cherry is supposed to be a native of England, it being frequently found in the woods; it grows large, and the timber is used by turners and other artificers in wood. From this sort the black-coroon-cherry is supposed to have been produced.

Cherry-trees thrive best in a dry hazely loam. In a gravelly soil they are very subject to blights, and seldom stand long good.

The wood of the cherry-tree is of great use to cabinet-makers, chair-makers, &c. as it is very durable, not liable to split, and looks nearly as well as the ordinary sort of mahogany.

CHERRY-TREE *with double flowers*, is a species of the former, and propagated for the beauty of its flowers, which are extremely fine. These are produced in large bunches, which renders the tree one of the most beautiful ornaments of a garden in the spring.

CHERRY-WINE, a very cooling and pleasant drink, made from the juice of cherries, properly fermented. The chief care necessary in making it, is to let the cherries hang upon the trees till they are thoroughly ripe, by which means their juice, which they yield in great abundance, will be the better perfected and enriched by the sun; to gather them in dry weather; press out their juice, and add a quantity of sugar proportioned to the strength you desire in the wine; for the more sugar there is added to the natural juice of the cherries, the stronger and richer the wine will prove, when of a proper age. When this is done the whole must be regularly fermented, according to the method

method laid down under the article fermentation. *See* FERMENTATION.

CHERVIL, the name of an annual plant raifed only from its feeds, which are black, very fmall, longifh, and ftreaked lengthwife.

It will thrive in any foil or fituation, and may be fown either in drills or broad-caft; but the former method is the beft, becaufe it greatly facilitates the weeding and cutting of the plants, whofe culture is, in all refpects, the fame with the common parfley. *See* PARSLEY.

The beft time to fow chervil is in the autumn, foon after its feeds are ripe; for they grow beft then, and the plants, which rife in that feafon, continue green all the winter; whereas thofe which are fown in the fpring feldom come up at all; or, if they do, their plants generally wither and decay, as foon as the warm weather fets in. The plants fown in autumn flower in April, perfect their feeds foon after, and then die away. To fave thefe feeds properly, their ftalks fhould be cut down when they begin to grow yellow.

Thofe who are fond of this plant, as many are in foups during the winter and fpring feafons, may have a fucceffion of it very young, by fowing it monthly during the feafon: but whoever ufes it fhould be careful to diftinguifh it from a poifonous plant that nearly refembles it, and called wild myrrh and cow-parfley. *See* COW-PARSLEY.

CHEST, the breaft, or that part of an animal's body which contains the heart, lungs, &c.

CHEST-FOUNDER, a diftemper incident to horfes, and occafioned by an improper treatment of an inflammation between the ribs. For if the inflammation be not difperfed in time, and the vifcid blood and juices fo attenuated by internal medicines, that a free circulation is obtained, fuch a ftiffnefs and inactivity will remain on thofe parts as will not eafily be removed; and this ftiffnefs is generally called cheft-founder.

The figns of this inflammation, are a ftiffnefs of the body, fhoulders, and fore-legs; attended fometimes with a fhort dry cough, &c. a fhrinking when handled in thofe parts.

Bleeding, foft pectorals, attenuants, and gentle purges, are the internal remedies; and externally the parts affected may be bathed with equal parts of fpirit of fal ammoniac, and ointment of marfhmallows, or oil of chamomile.

Thefe outward inflammations frequently fall into the infide of the fore-leg, and fometimes near the fhoulder; forming abfceffes there, which terminate the diforder. *Bartlet's Farriery, pag.* 57.

CHESNUT-TREE, the name of a tree, which well deferves the planter's care, affording excellent timber, and a very agreeable fhade. It will grow to a very great fize, and fpread its branches finely on every fide where it has room.

The leaves are large, and of a lucid green, and continue late in the autumn; nor are they fo liable to be eaten by infects, as thofe of the oak; nor is there any better food for deer, and many other animals, than the fruit of this tree.

Chefnut-trees are propagated by planting the nuts in February, in beds of frefh undunged earth. The beft nuts for fowing, are fuch as are brought from Portugal and Spain, provided they are not kiln dried, which is generally the cafe of thofe brought from abroad, to prevent their fprouting during their paffage; if they cannot, therefore, be procured frefh from the tree, it will be much better to ufe thofe of the growth of England, which are full as good to fow for timber or beauty, as any of the foreign nuts, though their fruit is much fmaller. The nuts fhould be preferved in fand, until the feafon for fowing, otherwife the mice and other vermin will foon deftroy them. Before you fet the nuts it will be proper to put them into water, to try their goodnefs, which is known by their weight; fuch of them as fwim upon the furface of the water fhould be rejected as good for nothing; but fuch as fink to the bottom, you may be fure are good.

In fetting thefe nuts, the beft way is to make a drill with a hoe, about four inches deep, in which you fhould place the nuts at about four inches diftance, with their eye uppermoft; then draw the earth over them with a rake, and make a fecond drill at about a foot diftance from the former, proceeding as before, allowing three or four rows in a bed, with an alley between, three feet broad, in order to clear the beds, &c. When you have finifhed your plantation, you muft be careful that it is not deftroyed by mice, or other vermin; which is very often the cafe, if they are not prevented by traps, or other means.

In April thefe nuts will appear above ground; you muft, therefore, obferve to keep them clear from weeds, efpecially while young: in thefe beds they may remain for two years, when you fhould remove them into a nurfery at a wider diftance. The beft feafon for tranfplanting thefe trees, is either in October, or the latter end of February; but October fhould be preferred. The diftance thefe trees fhould have in the nurfery, is three feet row from row, and one foot in the rows. If thefe trees have a downright tap-root, it fhould be cut off, efpecially if they are intended to be removed again; this will occafion their putting out lateral roots, and render them lefs fubject to mifcarry when they are removed for good.

The time generally allowed them in the nurfery is three or four years, according to their growth; but the younger they are tranfplanted, the better they will fucceed. Young trees of this fort are very apt to have crooked ftems; but when they are tranfplanted out, and have room to grow, they will, as they increafe in bulk, grow more upright, and their ftems will become ftrait.

After they have remained three or four years in the nurfery, they will be fit for tranfplanting where they are to remain; for the younger they are planted out the better they will fucceed. But if they are propagated for timber, it is by much the better method to fow them in furrows, and let them remain unmoved; for thefe trees are apt to have a downright tap-root, which, being hurt by tranfplanting, often checks their upright growth, and caufes them to fhoot out into lateral branches.

If you defign a large plantation of thefe trees for timber, after having two or three times ploughed the ground, the better to deftroy the roots of weeds, you fhould make your furrows about fix feet diftance from one another; in which you fhould lay the nuts about ten inches apart, covering them with earth about two inches deep; and when they come up, you muft carefully clear them from weeds. The diftance allowed between each row is for the ufe of the horfe-hoeing plough, which will difpatch a great deal of this work in a fhort time; but it fhould be performed with great care, fo as not to injure the young plants; therefore the middle of the fpaces only fhould be cleaned with this inftrument, and a hand-hoe ufed to clean between the plants in the rows, and alfo on each fide, where it will be unfafe for the plough to be drawn; and in hand-hoeing great care muft be taken not to cut the tender rind of the plant. But for the two firft years after fowing, it will be advifable to dig the ground each winter; becaufe the plants will be too fmall to admit the hoeing plough, and in fummer to hand-hoe the ground.

When thefe have remained three or four years, you will, if the nuts have fucceeded well, have many of thefe trees to remove; which fhould be done at the feafons before directed, leaving the trees at about three feet diftance in the rows; at which diftance they may remain for three or four years more, when you fhould remove every other tree, to make room for the remaining, which will reduce the whole plantation to fix feet fquare; which will be fufficient for them, till they are large enough for poles, when you may fell every other tree, within a foot of the ground, in order to make ftools for poles, which, in eight or ten year's time will be ftrong enough for making hoops, hop-poles, &c. for which purpofes they are preferable to moft other trees; fo that every tenth year here will be a frefh crop, which will pay the rent of the land, and all other incidental charges, and, at the fame time, a full crop of growing timber left upon the ground.

Chefnut-trees were formerly much cultivated in England, and doubtlefs produced good profit to the owners;

for the wood of this tree is equal in value to the beſt oak, and, for many purpoſes, far better; particularly for making veſſels to hold all kinds of liquor, it having the property, when once thoroughly ſeaſoned, of maintaining its bulk conſtantly; and is not, like other timber, apt to ſhrink or ſwell; and hence all the large caſks, tuns, &c. for wines in Italy, are made of this timber, as being preferred by the inhabitants to any other timber whatſoever. It is alſo very valuable for pipes to convey water under ground, as enduring longer than the elm, or any other wood. In Italy it is planted for coppice wood, and is much cultivated in ſtools, to make ſtakes for ſupporting their vines, as it will endure ſeven years, which is near double the time any other ſtakes will do. *Millar's Gard. Dict.*

CHEWING-BALLS, the name of a medicine adapted to reſtore a loſt appetite, an infirmity which horſes are often ſubject to, proceeding from a ſalt humour, and a bitter phlegm, which obſtructs the paſſage of the throat, and makes them loath their food.

Theſe balls are made in the following manner: Take a pound of aſſa fœtida, as much liver of antimony; half a pound of the wood of a bay-tree; an equal quantity of juniper-wood; and two ounces of pellitory of Spain: pound all theſe ingredients apart into a groſs powder, in order to which the woods muſt be previouſly well dried. Then put them all together into a mortar, and incorporate them with a ſufficient quantity of good verjuice, well clarified, pouring it in by degrees, till the whole is reduced to an uniform maſs. Make the whole into balls of an ounce and a half each, and dry them in the ſun. Wrap one of theſe balls in a linen cloth, and faſtening a thread thereto, make the horſe chew it for two hours in the morning, and he will eat as ſoon as you take off the bridle; do the ſame at night, and continue this method till the horſe recovers his appetite. When one ball is conſumed, put in another.

Theſe balls may be uſed on the road, as you travel, being faſtened to the bit of the bridle.

CHICKLING-*vetch*, called by gardeners, the common everlaſting pea, and by C. Bauhine, *lathyrus latifoliis*, a perennial plant, growing naturally in many parts of England.

A correſpondent of the editors of the Muſeum Ruſticum recommends this plant as well deſerving cultivation for the food of cattle, as the root, which will grow in almoſt any ſoil, yields every year a great burden of excellent provender.

"I ſowed, ſays this gentleman, three years ago, a rood of land, light, and but poor in quality, with this ſeed: the work was done early in the ſpring, the land being prepared as for barley.

"I ſowed it not in the broad-caſt way, as I ſhould have found it much more difficult to keep down the weeds; but I cauſed a ſlight furrow to be drawn the length of the land, with a light plough; and when the ſeed was thinly ſprained, or rather dropped into this, another was drawn at a foot diſtance, in which the ſeed was dropped in the ſame manner.

"An interval, or fallow ſpace, was then left at leaſt two feet wide; and then two more rows of the vetches, till the whole land was ſown. I muſt obſerve, that I covered the ſeed by means of a light harrow with wooden tines, drawn backward and forward acroſs the land.

"When the plants came up, I had them well hoed to clear the ground of weeds; and when they grew a little ſtrong, they were ſet out with the hoe to about a foot diſtance in the rows, that they might have room to ſpread and branch.

"The firſt year they yielded no great quantity of fodder, but they have ſince made me ample amends.

"The ſecond ſpring they came up very ſtrong and vigorous, branching out much; and when I turned a couple of horſes in to feed, they were very fond of it, eating it very greedily, though they were taken out of a good natural upland-paſture.

"The laſt ſummer the land was almoſt entirely covered, and it yielded a great deal of ſeed indeed: for experiment ſake, I cauſed a few roods to be mowed juſt before it flowered, and it made good hay, ſweet, and without being ſticky.

"I therefore think, from my little experience in the matter, I have ſome foundation for recommending this plant to the notice of the public. I could wiſh, indeed, I had been more accurate in my experiment; but what is paſt cannot be recalled: and ſome other perſon may, perhaps, hereafter, give the public more uſeful information on this head."

CHICKWEED, called by botaniſts *cucubalus*, flowers early in the ſpring, and, if it be ſuffered to grow, ſeveral times in the courſe of the year. The way to deſtroy it is therefore to pluck it up from time to time, before it can ſhed its ſeed.

The berry-bearing ſort, which grows with ſmooth, erect ſtalks, globular empalements, and ſtamina longer than the petals, is the wild lychnis, or white behen of the ſhops. This is a very rambling weed, natural to moſt parts of England, and is frequently called ſpatling poppy. Its roots are perennial, and ſtrike ſo deep into the earth, that they are not eaſily deſtroyed by the plough; for which reaſon, bunches of this plant are too common among corn, in land which has not been perfectly well tilled. Summer fallows, and carefully harrowing out every part of the roots, which ſhould then be burnt, will here prove the beſt and moſt effectual remedy,

CHICKWEED is alſo the name of an annual weed, called by botaniſts *alſine*. This weed, though it periſhes every year, will ſoon become very troubleſome, if ſuffered to ſtand till it ſheds its ſeeds, which Mr. Liſle thinks it will do ſeveral times in the year; for he obſerved on the 23d of October, a great deal of this weed, the branches of which carried many buds of bloſſoms, many flowers full blown, and many pods with white ſeeds almoſt ripe; ſo that its increaſe may be the leſs guarded againſt by any ſort of huſbandry in the common way. The repeated horſe-hoeings in the new huſbandry muſt here be of ſingular advantage; and, at all events, particular care ſhould be taken, to prevent the feeding of this plant upon dung-hills, where it is too often ſuffered to grow unnoticed and undiſturbed: for its ſeeds ſcattered there, and intermixed with the dung, will ſoon give birth to a multitude of weeds in the land upon which it is ſpread; unleſs it be kept, as indeed all dung uſed for manure ought to be, till it is thoroughly rotted, and the ſeeds have loſt their vegetative power.

To CHISSUM, to put forth roots, to grow.

To CHITT, to ſprout out, to grow.

CHITTED, ſprouted, ſhot out, grown.

CHIZZLE, bran, the huſky parts of ground wheat.

CHOCKY, the ſame with chalky, reſembling chalk, mixed with chalk, or of the nature of chalk.

CHOLIC. *See* GRIPES.

CHURN, the name of the veſſel in which the cream is coagulated by agitation.

There are two ſorts of churns, one called the common, or Dutch churn, and the other the barrel churn.

The common churn is repreſented on Plate VI. Fig. 2, 3. where Fig. 2. is the arbor or ſtaff; and Fig. 3. the body of the churn. The lower end of the ſtaff is placed in the body of the churn, and being raiſed with a pretty quick motion by the hand on the upper part of the ſtaff, the cream in the body is agitated, and by that means coagulated into butter.

Fig. 4, 5, 6, 7. repreſents the ſeveral parts of the barrel-churn.

Fig. 4. is the arbor of the barrel-churn. Fig. 5. its bung, or cover. Fig. 6. the body of the churn. And Fig. 7. the ſtand on which it is placed. The arbor cannot be taken out of the body of the barrel-churn, without the help of the cooper; but is here repreſented by itſelf, to ſhew the manner in which it is made. In Fig. 6. the churn is repreſented with the arbor on it, but not placed on its ſtand, in order to ſhew the latter. When the utenſil is to be uſed, the churn is placed upon its ſtand; the cream poured into it through the bung-hole, and the hole cloſed with its bung. The arbor is then turned round pretty faſt, by which the four leaves of the arbor agitate the cream, and coagulate it into butter. *See the article* DAIRY.

CIBOULES, a ſort of ſmall onions propagated only by ſeeds, which, if ſown in March, will be ripe in Auguſt;

August; and these are reckoned the best for keeping; but they may be sown in almost every season. They differ from the onions, of which they are probably a degeneracy, in that they do not form bulbs at their roots, but shoot out several upright blades, and those which produce the greatest number of these, are reckoned the best.

Their culture is the same with that of onions, like which they must be thinned, and well weeded. They will increase greatly, even in very dry summers, if they have been transplanted into beds of good earth, and those beds are kept well watered. The reddest, hardest, and mildest are the most esteemed.

CIDER, or CYDER. *See the article* CYDER.

CIONS, the shoots, or grafts which are fixed into the stock, in order to improve its fruit. *See the article* GRAFTING.

CIVES, a well known species of pot-herb, cultivated in kitchen gardens. They thrive best in a light rich ground, and are propagated by parting their roots, which never become bulbs; the best time for which is in March, though they may be transplanted in autumn, for they are very hardy; and in this case, they will produce blades fit for use early in the spring. It is for these blades only, which seldom grow above six inches high, and are very small and slender, that they are cultivated. They were formerly in great request for mixing with sallads in the spring, because they are milder than the ciboule, or Welsh onion. In good ground they will last three or four years, without removing, or any other trouble besides loosening the earth about them now and then, keeping them clear from weeds, and perhaps watering them a little in great droughts.

CLARY, the name of an herb cultivated in many kitchen gardens. The seeds should be sown during the spring, in good garden mould. When the plants are fit to remove, they should be transplanted into beds, and there set at least one foot asunder. If they are planted in more rows than one, it should be on an open spot of ground, at the same distance from one another, and with a space of at least two feet between the rows. After they have taken root, no farther care is necessary, except keeping them clear from weeds, and stirring the ground about them. In the winter and spring following, their leaves, which are the only part used, will be fit for gathering; and in the ensuing summer they will flower, seed, and decay; so that a succession of young plants should be raised every year.

CLASPERS, the threads or tendrils of creeping plants.

CLAVER, a word used in some counties of England for clover. *See* CLOVER.

CLAW, the foot of a beast or bird, armed with sharp nails.

CLAY, an unctuous and tenacious earth, justly accounted the stiffest of all soils.

Clays are of different sorts, and of as different colours. One kind of them is so obstinate, that scarce any thing will subdue it; and another so hungry, as not to be satiated without uncommon pains, because it absorbs whatever is applied, and turns it to as bad a clay as itself. Some clays are fatter than others, some more slippery; all of them tenacious of water on the surface, where it stagnates, and chills the plants, without penetrating the soil; and in dry seasons they harden with the sun and wind, are very barren, and extremely untractable. The closeness of clay hinders plants from extending their roots to search for their necessary food, and prevents the entrance of water, which would help to convey it to them.

The more unctuous and fat clay frequently lies upon the other, and has often a bed of chalk beneath it: but neither is this worth any thing till loosened, and fitted to admit the influence of the sun, air, frost, &c. The blue, white, and red clay, if strong, are all unkind: the stony and looser sort is sometimes tolerable; and the light brick-earth does very well with most fruit-trees.

Clay, in general, of whatever kind it be, is, of all earths, the very worst for vegetation: yet even this, as well as any other untoward soil, may, with industry, and proper correctives, be made to produce roots and plants which require the lightest and hollowest mould.

Among all the manures for clay, sea-sand claims the preference, founded upon experience, as best suited to break its too great cohesion. Dr. Cox has given us a very accurate account of the sea-sand used by the farmers of Cornwall, by which their lands are greatly benefited, and their crops largely increased. Doubtless the husbandmen of other parts of the kingdom, whose lands lie within a moderate distance of the sea, might find the same advantage from using the same manure, which many of them are too apt to overlook.

"The sea-sand made use of in the agriculture of Cornwall, says that ingenious gentleman, lies commonly at or near the shore. To distinguish it from what is useless, it is proper to observe, that this sand is formed by the grating of stones, shells, &c. rolled, and tumbled over by the wash of the sea. If the matter be shelfy, as it is called, that is, the particles formed by the rubbing of stones only, it is of small value: but if it be notably shelly, it is the thing desired. Of this shelly sand there are three colours. About Plymouth, and the southern coast, it is bluish, or grey, like ashes; which I conceive to be from the breaking of muscles chiefly, and oister-shells mixed with it. Westward, near the land's-end, the sand is very white; and in Scilly, glittering. This I think comes from the mouldering of moor-stones, or a kind of free-stone, mingled with the white shells of the scallop-fish. On the north-sea, about Padstow, and eastward of Lundy, the sand is rich, of a reddish-brown colour tinged with yellow, and consists cheifly of the broken shells of cockles; which I guess to be of that colour there, from the wash of the Severn, which falls very dirty into the Severn-sea.

"Besides these differences in the colour of the sand, there is also another in the bigness of the grain. The small is reckoned best for the tenant, who takes to tillage only for four years; because it works soonest, and yields the most speedy return. The larger grain is thought to be more profitable for the landlord, because it abides longer in the ground, and make the pasture afterwards the richer.

"In Falmouth-haven, near St. Mawe's Castle, there is a sort of sand, or rather coralline, that lies about a foot under the ooze; which ooze being removed, and the bed opened, this sand is taken up by a dredge, and is used about Truroe, Probus, &c.

"West of the mount, in Portcuthnoe-cove, is a large shelly sand. In White-sand-bay, and about St. Ives, it is very white and small.

"About Minver, Perinsand, and Lelant, the sands are frequently blown up by the wind, and cover abundance of good land. Some houses and even churches have been buried in it; nor has any method hitherto discovered been able to prevent its devastation.

"Of all these sands, the best are accounted, as to colour, first the reddish, next the blue, then the white. As to kinds, the most shelly, and the coralline are the best, especially if it be taken up from under the salt-water, either by dredges, or being left almost dry by the ebbing of the tide. The blown sand is accounted of no use: and, in general, if sand be only well drained of salt water, so that it can be conveniently carried, it is better than that which has lain long drying in the sun and wind, which takes off much of its virtue.

"These useful sands are carried by lighters as far up into the country as the tides will serve for that purpose, and there they are cast on shore. From thence they are fetched, in some places, by wheel-carriages; but in most, by reason of the hilliness, narrowness, and badness of the ways, on horse-back; one horse carrying about thirteen or fourteen gallons. One man drives seven or eight of these horses, tailed together, to the distance of nine or ten miles from the sand-place; and each horse-load comes to about eight-pence or nine-pence, in some places; though not so much in others: for where it is dredged out of the sea, it costs but twelve or thirteen shillings the lighter, containing sixscore horse-loads, at the landing-quay, or sand-place; and where it is loaded from the dry-beach, after the ebb, it is not above four shillings the lighter, exclusive of the land-carriage, which is computed at about thirty-two thousand pounds a year, in the whole of that country.

"When this sand is brought home, it is spread on the ground intended for wheat; or usually in the first crop of four, whatever be the grain. For after four crops, the Cornish farmers generally leave their land to pasture for six or seven years, before they till it again: and indeed the grass is so good, immediately after tillage, that they commonly mow it the first year, and which they call mowing of gratten.

"The Cornish acre contains eight-score yards, of eighteen feet to the yard. On one of these acres, if near the sand-place, good husbandmen bestow three hundred sacks, or horse-loads: if within the reach of three turns a day, two hundred; if within two turns, one hundred and fifty; where only one turn can be made, eighty or an hundred; and so in proportion at greater distances, even to twenty or thirty sacks on an acre rather than none.

"The effect generally is, that where much sand is used, the seed is as much as the straw little. Land thus manured has produced barley, of which the ear has been as long has the stalk it grew on. But where less sand is used, there is but little, and that little hungry grain." *Philosoph. Transact. Numb.* 113.

Where this excellent manure is found, it is taken up by a large bag of the strongest canvas, to the mouth of which is fixed an iron hoop, or frame, to keep it open, and sink it to the bottom of the sea, that it may take up the sand and coral, as it is dragged along by the bargemen. The Rev. Mr. Borlace says, that a barge-load, which is usually delivered for ten shillings, or less if near the place of dredging, will dress an acre, provided the land be tolerably good.

Large quantities of this shelly sand lie neglected on most of the coasts of England. The benefits arising from it, particularly when laid on clayey grounds, are indeed somewhat slow, but they are very lasting. The improvement is not the first or second year; because this manure consists of hard bodies, such as the sand itself, shells, fragments of coral, and other calcarious substances, which require time to dissolve them, and which afterwards enrich the land for many years. The best is that which is mixed with coral, and other hard substances of that kind. It gives the heat of lime, and the fatness of oil, to the land it is laid upon. Being more solid than shells, it contains a greater quantity of fermenting particles in an equal bulk; nor does it dissolve in the ground so soon as shells, but decaying more gradually, continues longer to impart its warmth to the juices of the earth.

Similar to this is the practice in Ireland, in that part of the bay of Londonderry, called Loughfoil, towards the eastern side of which lie several banks, about the level of low-water. They are formed of the shells of several sorts of sea fish, particularly periwinckles, cockles, limpets, &c. The country people go thither with boats, and take loads of these shells, which they leave in heaps on the shore, till they are well drained, and thereby rendered lighter for farther carriage. They then carry them in boats as far as the river will allow, and afterwards in sacks on horses, six, seven, or more miles up in the country. They allow sometimes forty, but more commonly eighty barrels to an acre. These shells agree with boggy, heathy, clayey, wet, or stiff land, but not with sandy. They seem to give the land a sort of ferment, as yeast does to bread, opening and loosening the clods, and by that means making way for the roots to penetrate, and the moisture to enter into the fibres of the roots. This manure continues so long, that the archbishop of Dublin, from whom this was communicated to the Royal Society, could not find any person able to determine the time of its duration.

The reason of its long continuance seems to be, that the shells melt every year a little, till they are all spent, which requires a considerable time; whereas lime, &c. operates, in a manner, at once. But it is to be observed, that, in six or seven years, the ground becomes so mellow, that the corn which grows on it cannot support itself, and the land must be suffered to lie a year or two, that the ferment may be a little quieted, and the clods harden; after which it will bear as long again, and continue so to do, with the like intermission, for twenty or thirty years.

The good and lasting effects of shelly-sand, for the improvement of clay, afford a strong presumption that there is an acid in the clay, which the shells absorb or correct: for when that acid is removed, the clay becomes more easily soluble, or miscible with water, or, as the farmers term it, is rendered mellow. This is contrary to the opinion of a very ingenious gentleman, Dr. Home, who, because he could not separate an acid from clay, concluded that there was none in it. That the first object in the improvement of clay is the destroying of this acid, is pretty evident from the qualities of all the substances useful for this purpose; every one of them being of the calcarious kind. The tenacity of clay does not seem to be owing to the smallness and unctuous smoothness of its particles; for in this some marles exceed it, and yet are perfectly and easily soluble in water, probably because they are of a calcarious nature: and if clay be rendered in some degree calcarious, by the addition of alcaline or calcarious substances, so long as it continues in that state, it is said to be mellow; that is, it is soluble like marle, and continues fit for the production of plants, till the acid in the air either neutralizes the alcali, or so far impregnates the calcarious substances, that they can no longer attract the acid. If this be fact, as it seems to be, common sand can be of little use; because the clay will cling as close to a stone, or grain of sand, as it would to part of itself, if the stone, or sand, does not so far change the body of the clay, as to take off its tenacity; and therefore Dr. Cox seems to be very right in saying, that the sand which is formed by the grating of stones only, is of little use as a manure. However, as some eminent writers on this subject strongly recommend sand in general, though they all agree in giving the preference to sea-sand, it may not be amiss to hear what they have said on the subject.

Columella, speaking in general terms, says, that his uncle used to carry sand on clay, and on the contrary, bring clay on sandy grounds, with good success.

Mr. Worlidge says, that the best sand for fertility is that which is washed from hills or other sandy places by the violence of rain; and that sands which are dry have little fertility in them. *Systema Agriculturæ, page* 67.

Mr. Bradley, after dividing sand into two general sorts, as Dr. Lister does, viz. the soft, round-grained sand, such as is found in bogs and hills; and the sharp or rag-sand, as it is commonly called, taken from the bottom of rivers, the sides of highways, or the sea; advises laying even the former on heavy soils, especially if it happens to be mixed, as it sometimes is, with rotted vegetable or animal substances: to which he adds, that its efficacy will be increased by the addition of sand of a sharper nature, about a load of which last, if used alone, should be spread upon every rod of very stiff land: for a sufficient quantity of it must be allowed, or else the clay will soon overcome it. *Complete Body of Husbandry, page* 84.

"The use of sand, says Mr. Miller, is to make the clayey earth fertile, and fit to feed vegetables, &c. for earth alone is apt to coalesce, and gather into a hard coherent mass, as is apparent in clay; and earth thus glued, as it were, together, is no way disposed to nourish vegetables: but if sand, &c. that is, hard crystals, which are not dissolvable in water, and still retain their figure, be intermixed with such earth, they will keep its pores open, and the soil loose and incompact, by which means the juices will circulate, and plants are nourished thereby. By means of sand, the earth is rendered, in a manner, organical; pores and interstices being thereby maintained, somewhat analogous to vessels, by which the juices may be conveyed, prepared, digested, circulated, and at length excerned, and thrown off into the roots of plants." *Miller's Gard. Dict.*

Small gritty gravel operates in nearly the same manner, as an opener of the earth, and is strongly recommended

mended by Mr. Evelyn, Mr. Worlidge, Mr. Bradley, and Mr. King. Good crops have been produced by very ftiff and four land, after it has been manured with gravel, which, to fit it for this purpofe, fhould be fkreecened, or fifted, fo as to leave among it as few ftones as poffible.

Shell-marle, or any marle, which makes a ftrong effervefcence when an acid is dropped upon it, is a particularly good manure for clay; becaufe diffolving eafily in water, it gives a fufficiently free paffage to this fluid, by which means the clay is kept dry even in winter: and if the foil be of a cold four nature, the abforbent quality of the marle deftroys that mineral acid, and keeps the ground warm.

The foffile-fhells which have been found in fome countries at a great diftance from the fea, are a good manure, if they ftill retain their quality of fhells: but befides their being generally petrified, they never are fo ferviceable as thofe which are taken from the fea-fhore.

All animal and vegetable fubftances are likewife proper manures for clay. *See the article* MANURE.

The alcaline quality of the afhes of all vegetables, and the calcarious quality of coal-afhes, render them fingularly beneficial to ftiff and four land, for which purpofe they are fuccefsfully ufed in the neighbourhood of fome great cities where coal is burnt for fuel. They open clayey grounds, and correct their bad qualities. The gardeners and farmers about London know their value, and make a very profitable ufe of them, particularly to bring into order thofe grounds which have been dug for brick earth. After fpreading thefe afhes upon the clay bottom, they either fow horfe-beans, or fet the early Spanifh, or, fometimes, the Windfor-bean, in thofe fpots; or elfe they lay fuch lands down with rye-grafs, which generally fucceeds very well. Mr. Bradley, blaming the people of Staffordfhire, and the countries adjoining, where there are coal-pits, for not improving their many heavy grounds around thofe pits, by manuring them with coal-afhes, which might eafily be burned out of the wafte coal, fays, "That wherever there are plenty of coal-pits, there can be no want of good profitable land." On the fame principle, we may account for the effects of the calcination of earth, commonly called, burn-baking, or Devonfhiring. *See the article* BURN-BAKING.

Lime, as it is generally ufed, is not found to be of fo great fervice in the improvement of clay, as a long eftablifhed practice might give room to think, or its qualities reafon to expect; becaufe its particles are fo extremely fmall, that when feparated, or mixed with the clay, they foon become part of its body, and, being fo much divided, are fpeedily faturated by the acid, either in the clay, or in the air: the beft method, therefore, of ufing lime as a manure for clay is, to fpread the lime-ftone unburnt; in which original ftate acids effervefce ftrongly with it, and therefore it will be likely moft effectually to mellow the clay. It is likewife, in this its natural ftate, attended with the farther advantage of faving the expence of burning, and becomes a very lafting manure; nay, probably a perpetual one, if the ftones are broke into fmall pieces, which is the proper method of ufing it; as is practifed at Horneton in Oxfordfhire, where they manure their land with a fort of ftone, common in thofe parts; and about Devonfhire, where a kind of red rock, very tender, and eafily broken into fand, is found to be of extraordinary fervice to clay, or other ftiff foils: for any foft ftone, broken fmall, will be of advantage to cold lands, if laid upon them. We find by Pliny, that lime was ufed as a manure by the ancient Britons, whofe lands were thereby rendered extremely fertile.

Mr. Evelyn advifes ufing lime a little flacked for cold, wet grounds, and ftiff clays; and obferves, that it is apt to over-heat dry foils.

Chalk operates in nearly the fame manner as lime: but, as Mr. Lifle juftly remarks, if it be laid on clay, it will, in time be loft, and the ground will return again to its former condition of clay; as we have already mentioned under the article chalk. *See* CHALK.

CLAYEY, mixed with clay, partaking of the nature of clay.

CLAY LANDS, fuch as partake of the nature of clay. *See the article* CLAY.

The natural produce of clay lands, with regard to weeds, is goofe-grafs, or wild tanfey, large daifies, thiftles, docks, May-weed, poppies, &c.

CLEARING, a term ufed in threfhing corn, to fignify a heap large enough to winnow.

CLEDGY, ftiff, ftubborn, hard, tenacious, mixed with clay.

CLETCH, a brood, as of chickens, &c.

CLOD, a lump of earth or clay.

CLODDING-BEETLE, a large beetle ufed in fome parts of England for breaking the clods. This operation may be much fooner performed, and at far lefs expence, by the fpikey-roller. *See the article* SPIKEY-ROLLER.

CLOVER, the name of a well known plant, and of which there are a great variety of fpecies; but only three of them cultivated in the open fields for the food of cattle, viz. the red Dutch clover; the white Dutch clover; and the hop-clover.

The firft fort is fufficiently known in England by the name of red clover, and therefore needs no defcription. It is called by Linnæus, *Trifolium caule erecto, foliolis oblongo-ovatis integerrimis, fpicis ovatis, calycibus fetaceis.*

Since red clover has been cultivated in England, great improvements have been made in clay lands, which before produced little except rye-grafs, and other coarfe bents; but, being fown with red clover, have produced more than fix times the quantity of fodder they formerly did: whereby the farmers have been enabled to feed a much greater ftock of cattle, than they could do before, with the fame extent of ground, which has, at the fame time, enriched the foil, and prepared it for corn; and hence it is now common, where the land is kept in tillage, to lay down their ground with clover, after having had two crops of corn, whereby there is a conftant rotation of wheat, barley, clover, or turnips, on the fame land. The clover-feed is generally fown with the barley in the fpring; and when the barley is taken off, the clover fpreads and covers the ground; and this remains two years, after which the land is ploughed again for corn.

Clover is a biennial plant, whofe roots decay after they have produced feeds; but by eating it down, or mowing it, when it begins to flower, it caufes the roots to fend out new fhoots, whereby the plant is continued longer than it would naturally do. The common allowance of feed for an acre of ground is ten pounds. In the choice of the feed, that which is of a bright yellow colour, inclining to brown, fhould be preferred; and the pale coloured thin feed fhould be rejected. The clover feed fhould be fown after the barley is harrowed in, otherwife it will be buried too deep; and after the feeds are fown, the ground fhould be rolled, which will prefs the feeds into the ground; but this fhould be done in dry weather, for moifture will often caufe the feeds to burft; and when the ground is wet, the feeds will ftick to the roller. The above is the method generally practifed by moft people, in fowing this feed with corn: but it will be much better if fown alone; for the corn prevents the growth of the plants till it is mowed and taken off the ground, fo that one whole feafon is loft; and many times, if there be a great crop of corn upon the ground, it fpoils the clover, fo that it is hardly worth ftanding; whereas, when it is fown without any other feed, the plants will come up more equal, and come on much fafter than that which was fown the fpring before under corn.

It is therefore advifable to fow the feed in Auguft, when there is a profpect of rain foon after; for as the ground is, at that feafon, warm, fo the firft fhower of rain will bring up the plants, and thefe will have time enough to get ftrength before winter: and if the clover be well rolled fome time in October, when the ground is not too wet, it will prefs the ground clofe to the roots, and caufe the plants to fend out more fhoots: the fame fhould be repeated in March, which will be found very ferviceable to the clover. The reafon for preferring this feafon rather than the fpring, for fowing the feeds, is, becaufe the ground is cold and wet in fpring, and if much rain fall after the feeds are fown, they will rot in the ground; and many times when the feed is fown late in the fpring, if the feafon fhould prove dry, the feeds will not grow. The other feafon is therefore the fureft, and confequently fhould be preferred.

About the middle of May this grafs will be fit to cut, when the greateft care fhould be taken in the making it into hay; for it will require a great deal more labour and time to dry than common grafs, and will fhrink into lefs compafs; but if it be not too rank, it will make extraordinary rich food for cattle. The time for cutting is, when it begins to flower; for if it ftands much longer, the lower part of the ftems, and the under leaves will begin to dry, whereby it will afford a lefs quantity of hay, and that not fo well flavoured.

Some people cut three crops in one year of this grafs; but the beft way is to cut only one in the fpring, and feed it the remaining part of the year, whereby the land will be enriched, and the grafs will grow muft ftronger.

One acre of this plant will feed as many cattle as four or five acres of common grafs; but great care fhould be taken of the cattle when they are firft put into it, left it fill them with wind and kill them, which is called their being hoven. *See the article* HOVEN.

In order to prevent this accident fome turn them in for a few hours only at firft, and fo ftint them as to quantity; and this by degrees, letting them at firft feed one hour only in the middle of the day, when there is no moifture upon the grafs, and fo every day fuffer them to remain a longer time, until they are fully feafoned to it: but great care fhould be taken never to turn them into this food in wet weather; or if they have for fome time been accuftomed to this food, it will be at leaft proper to turn them out at nights in wet weather, and let them have hay, which will prevent the bad confequences of the green clover. Others give their cattle ftraw while they are feeding upon this grafs, to prevent the ill effects of it; but this muft not be given them in the field, becaufe they will not eat it, where there is plenty of better food. There are others who fow rye-grafs among their clover, which they let grow together, in order to prevent the ill confequences of the cattle feeding wholly on clover; but this is not a commendable method, becaufe the rye-grafs will greatly injure the clover in its growth, and the feeds will fcatter, and fill the ground with bent.

Where the feeds are intended to be faved, the firft crop in the fpring fhould be permitted to ftand until the feeds are ripe, which may be known by the ftalks and heads changing to a brown colour, when it fhould be cut in a dry time; and after being well dried, it may be houfed till winter, when the feeds fhould be threfhed out; but if the feeds are wanted for immediate fowing, it may be threfhed before it is houfed or ftacked; but it muft then be well dried in the field, otherwife the feeds will not quit their hufks.

It has been a common complaint among the farmers, that they could not threfh out thefe feeds, without great labour and difficulty; but this is chiefly owing to their cutting the fpring crop, when it begins to flower, and leave the fecond crop for feed; which ripening fo late in autumn, there is not heat enough to dry the hufks fufficiently; whereby they are tough, and the feeds rendered difficult to get out. This complaint may therefore be entirely removed by leaving the firft crop for feed, as above directed; and then the ground will be ready to plough and prepare for wheat the fame year, which is another advantage.

When cattle are fed with this hay, the beft way is to put it in racks, otherwife they will tread a great deal of it down with their feet. This feed is better for moft other cattle than milch cows, fo that thefe fhould have very little of it, left it fhould prove hurtful to them; though it is not near fo injurious to any fort of cattle when dry, as it is when green.

The fecond fort, namely, the white Dutch clover, grows naturally in moft of the paftures in England, and is generally known among the country people, by the name of white honey-fuckle. Linnæus calls it, *Trifolium capitulis umbellaribus leguminibus tetrafpermis, caule repente.*

This is an abiding plant, whofe branches trail upon the ground, and fend out roots from every joint, fo that it thickens and makes the clofeft fward of any of the fown graffes; and it is the fweeteft feed for all forts of cattle yet known: therefore when land is defigned to be laid down for pafture, with intent to continue fo, it fhould be fown with the feeds of this plant. The ufual allowance of this feed is eight pounds to one acre of land; but this fhould never be fown with corn, for if there is a crop of corn, the grafs will be fo weak under it, as to be fcarce worth ftanding; but fuch is the covetoufnefs of moft farmers, that they will not be prevailed on to alter their old cuftom of laying down their grounds with a crop of corn, though they lofe twice the value of their corn by the poornefs of the grafs, which will never come to a good fward, and one whole feafon is alfo loft; for if this feed is fown in the fpring without corn, there will be a crop of hay to mow by the middle, or latter end of July, and a much better after-feed for cattle the following autumn and winter, than the grafs which is fown with corn will produce the fecond year. The feed of this fort may alfo be fown in autumn, in the manner before directed for the common red clover; and this autumnal fowing, if the feeds grow kindly, will afford a good early crop of hay the following fpring; and if, after the hay is taken off the land, the ground be well rolled, it will caufe the clover to mat clofe upon the ground, and become a thick fward.

The feeds of this white Dutch clover is annually imported from Flanders, by way of Holland, whence it received the name of Dutch clover; not that it is more a native of that country than of this, for it is very common in moift paftures, in every county in England: but the feeds were never collected for fowing in this country, till of late years; nor are there many perfons here, even now, who fave this feed, though it may be done if the fame method, as is practifed for the red clover, be taken with this fort; it fhould therefore be recommended to every farmer, who is defirous of improving his land, to fow carefully an acre or two of this white clover for feed, which will fave him the expence of buying for fome years, when the price is great; and there will be a fure market for any quantity he may have to fpare.

The reader will find a farther account of this grafs under the article PASTURE.

The third fort, namely hop-clover, called by fome yellow meadow trefoil, and by botanifts, *Trifolium fpicis ovalibus imbricatis, vexillis deflexis perfiftentibus, calycibus nudis, caule erecto*, grows naturally among the grafs in the upland paftures of this country; but the feeds are frequently fold in the fhops, and are by many mixed with the other forts of clover and grafs-feeds, for laying down ground to pafture. This plant grows with upright branching ftalks about a foot high, garnifhed with trifoliate leaves, whofe lobes are oblong and heart-fhaped, but reverfed, the narrow point joining the foot-ftalks. The flowers, which are yellow, grow from the wings of the ftalk, upon long foot-ftalks, collected into oval imbricated heads, having naked impalements lying over each other like fcales, fomewhat like the flowers of hops, from whence the plant had the name of hop-clover. But there are two forts of this clover, which grow naturally in England. The other is a much fmaller plant than this, and generally known by the name of nonefuch, or yellow hop-trefoil. *See the article* NONESUCH.

The hop-clover is ftrongly recommended by the following circumftances. 1. It not only grows, but flourifhes on the moft barren fands, and therefore muft be a very proper grafs to cultivate on fuch unfertile foils, where any other grafs that is worth notice will not grow at all. 2. It is not apt to fwell cattle, as the red clover does. 3. In good ground it will continue long, and bear a very good feed or crop, as Mr. Tull, though prejudiced againft clovers, confeffes; and, by its flourifhing both on fands and clay, which have not been ploughed for many years, it feems likely to continue long in any foil.

CLOUGH, a valley between two fteep hills. It alfo fignifies a cliff.

CLOUT, an iron plate on the axle-tree of a carriage.

CLUMP, a number of trees growing together without ſhape or order.

CLUNG, cloſed up, or ſtopped; ſpoken of hens when they do not lay. It is alſo applied to wood, or any other thing that is ſhrivelled, or ſhrunk up, when it is ſaid to be clung.

CLUSTER, a bunch, a number of things of the ſame kind growing or joined together. Alſo a number of animals, or a body of people, collected together.

M. de Chateauvieux has made a very remarkable experiment on ſowing corn in cluſters, which muſt not be omitted here.

“ It is of great conſequence, ſays that ingenious and aſſiduous cultivator, to know which is the moſt profitable way of ſowing beds with corn; I mean, that by which they will be ſtocked with a proper number of plants; for when too much ſeed is ſown, the plants hurt one another; and when too little, the earth is not enabled to produce ſo much as it is capable of doing.

“ The buſineſs, therefore, is to determine what number of plants would be moſt advantageous. Luckily the difference is wide enough between the too great, and the too ſmall number; and the produce of the crop cannot only be diminiſhed by an exceſs one way or the other.

“ But whatever certainty we may acquire with reſpect to this intereſting point, we cannot flatter ourſelves that we ſhall be always able to keep it in our practice. The various accidents to which corn is liable, from the hour of its being ſown till it is reaped, will always fruſtrate the methodical arrangement which we may have intended to give the plants.

“ The difficulty of ſucceeding in this enquiry ought not however to diſcourage us: for it would be attended with ſuch advantages, as would make very ample amends for all the labour beſtowed upon it. Let us then have recourſe to experiments. Thoſe that are made with this view can never be quite uſeleſs. If they do not lead us to the very thing we are in ſearch of, they may at leaſt diſcover to others what may be of ſervice.

“ According to our principles, the diſtance between each plant ought to be equal throughout the whole length of the rows, that all of them may have an equal quantity of earth to draw their nouriſhment from.

“ Several experiments have ſhewn, that ſix inches is not too great a diſtance for the plants to be at from one another. In this caſe it would be ſufficient to ſow one grain of wheat at every ſix inches diſtance. According to this diſpoſition, a field well prepared ought to produce the greateſt crop. The plants will commonly branch out ſo as to have twenty, thirty, or forty ſtalks: I have had ſome with upwards of eighty. It is pity that this exact diſtribution of the ſeed cannot ſubſiſt long. An accident I lately met with ſoon convinced me that it was neceſſary to increaſe the quantity of ſeed, and that very conſiderably.

“ This does not, however, yet hinder me from thinking, that if any eaſy method could be found to have a plant of wheat exactly at every ſix inches diſtance in the rows, it would be the beſt way of ſowing lands. I have often conſidered how this could be reduced to practice, as well to ſatisfy my curioſity, as to enable me to proceed with more certainty in my operations. When a theory is known to be good, we are ſtrongly encouraged to draw all poſſible advantages from it for the practical part; we proceed with confidence and pleaſure.

“ Experience having convinced me that it never would be poſſible to have a plant at every ſix inches in each row, by ſowing only a ſingle grain of wheat at thoſe diſtances, it naturally followed, that the way to have the ground better covered with plants was, to ſow more grains. The next queſtion was, how many grains ſhould or ought to be ſown in each place? Should it be two, three, or more? Experience only could anſwer this queſtion. I therefore tried the following experiment. I ſowed a different number of grains in cluſters, ſix inches diſtant from each other, putting one grain in the firſt, two in the ſecond, and ſo on to the ſixth, which had ſix grains: then I began again, and went on as before, till the whole length of the row was ſowed in this manner. The produce of each cluſter was to ſhew me whether it would be beſt to double, triple, or quadruple the ſeed, which it was plain had been ſown too thin, when a ſingle grain was dropt at every ſix inches.

“ The winter of 1753 was already far advanced when theſe thoughts firſt occurred to me. It was then too late to try this experiment with wheat; but that I might not loſe a year, I did it in the ſpring with barley; not doubting but that corn, which is uſually ſown in March, might furniſh me with ſome future hints for the culture of that which remains longer in the ground.

“ Accordingly on the ninth of April 1754, I ordered another bed to be ſowed with barley in my preſence, and in the manner I have juſt related. I counted all the grains of each cluſter myſelf. They were ſown in three rows. I varied the experiment in the rows next the ſouth, by ſowing no cluſters there of leſs than three, four, five, or ſix grains: which I continued the whole length of the row. At harveſt, all the cluſters in which ſeveral grains had been ſowed, were ſo thick, that they touched one another.

“ What is of moſt conſequence to our culture is, to know the produce of each cluſter. But it will be neceſſary previouſly to obſerve, that the cluſters were ſown in rows extending forty feet in length, and that the beds were five feet wide.

“ Reſults:

The *South row*

ſowed with 6, 5, 4, and 3 grains,
produced 661, 624, 447, and 493 ſtalks.
In all 2225 ſtalks.

“ The *Middle row*,

ſowed with 1, 2, 3, 4, 5, and 6 grains,
produced 48, 72, 147, 204, 219, and 487 ſtalks.
In all 1177 ſtalks.

“ The *North row*

ſowed with 6, 5, 4, 3, 2, and 1 grain,
produce 502, 372, 345, 276, 200, and 92 ſtalks.
In all 1787 ſtalks.

“ Conſequently the whole number of ſtalks in the three rows was 5189. They yielded ſeventeen pounds of grain, beſides a very conſiderable quantity ſhed in cutting.

“ On the footing of this crop, an arpent of thirty-ſeven ſquare toiſes (equal to about one acre and three quarters of a rood Engliſh) would contain at leaſt forty-four beds five feet wide, which was the breadth of the beds on which this experiment was made. The beds would be 222 feet long: the produce of one of them would be ninety-three pounds, eight ounces; and that of the forty-four, 4138 pounds, eight ounces: a very conſiderable crop, and which might be carried ſtill further by other experiments of the ſame kind.

“ The following obſervations deſerve the reader's utmoſt attention. Firſt, by this experiment, I have very nearly effected what I aimed at, viz. to have two or more plants grow ſo cloſe together, as to ſeem but one; and that at ſix inches diſtance from each other. If the three rows had been joined together lengthways, they would have been 120 feet long, and ought to have contained 240 plants only: but the diſtances, which were marked by gueſs, not being exactly ſix inches each, ninety-ſix cluſters were ſown in each row, which made ſixteen cluſters over and above. By this means ſeveral of them were nearer than ſix inches to one another.

“ Two hundred and eighty-eight cluſters were ſown, all of which produced plants, except twenty-five, which either did not ſprout, or the plants periſhed. This deficiency is not very conſiderable; but we muſt obſerve, 1. That almoſt all the places where this happened had been ſown with only one or two grains of corn. 2. That it was in the middle row that the greateſt number of plants was wanting. 3. That the ſouth row, in which the ſmalleſt quantity ſown for any one tuft, was three grains, furniſhed and retained its full number of plants: and laftly, that almoft all thofe which were next to the vacant fpaces, were ftronger than the reft, and thereby made amends for the lofs of the others.

"Secondly, the whole number of the ftalks amounted to 5189, which is after the rate of forty-three ftalks and a quarter to a foot: but it is much more confiderable in the fouth row, which having produced in all 2225 ftalks, the proportion is fifty-five and a half to a foot. The caufe of this difference is eafily feen. The expofition of that row to the fouth being more favourable than that of the others, may have contributed thereto; but it was very plain that it was chiefly owing to none of the clufters in that row being fown with fo few as one or two grains.

"Thirdly, we fee that the increafe of the ftalks was, in general, in proportion to that of the feed; only the clufters that were fown in three grains in the fouth row, produced forty-fix ftalks more than thofe which were fown with four grains; but ftill the general refult of the three rows was exactly in the fame progreffion, as appears by the following recapitulation:

RECAPITULATION.

Stalks produced by 1 grain	140
2 gr.	272
3 gr.	916
4 gr.	996
5 gr.	1215
6 gr.	1650
Total	5189

"Fourthly, the ears were nearly equal, at leaft in two thirds of the length of the rows: the other third furpaffed the reft very confiderably.

"Fifthly, the difference between the produce of the clufters fowed with one, and with fix grains, is extremely great. The former produced but 140 ftalks, the other multiplied to 1650. It is true the number of the clufters of fix grains is greateft, which is fome fmall diminution of this difference.

"Sixthly, I obferved feveral ftalks from which others had fhot out, all as ftrong, and as long, as thofe from which they derived their origin. They proceeded from the firft joint above the furface of the earth, generally at the height of three, four, or five inches, and were two, three, and fometimes four in number. I never perceived this kind of multiplication before; but had till then always obferved it to be at the neck, or point of feparation between the roots which defcend, and the ftalks which afcend, that the ftalks branched out.

"Seventhly, I fufpected, in the fummer, what was the caufe of the great vigour of the plants of this experiment; but I faw it much plainer after harveft: for, upon pulling up fome of the tufts of ftubble, I found their roots innumerable. This fact is ftrictly true. I could not count them upon any one plant that had more than fifteen or twenty ftalks. Thefe roots were in fuch bundles, and fo confufedly interwoven one with another, that after counting feveral hundreds of them I was forced to give up the tafk. Their length and thicknefs was anfwerable to their number.

"I muft now remind the reader of what I faid before, that the feveral accidents which I met with in my firft experiments, fhewed me it was neceffary to increafe the quantity of the feed. I did fo, by fmall degrees, from year to year. It is equally important for the fuccefs of the new hufbandry, not to run into another extreme, by loading the earth with more plants than it can nourifh: the crop would be confiderably diminifhed thereby.

"It appears from this experiment, that the plants of the clufters that were fowed with fix grains, did not hurt one another: on the contrary, their being fown in that manner proved an advantage, fince they produced much more than the others; whence it follows, that we may, without danger, extend the quantity of feed beyond the limits of the new hufbandry. Its principles are not the lefs true; but they leave the farmer at liberty to ufe his own prudence in the application of them, according to the nature of the foil.

"Thofe principles, which fuppofe that every plant is to fubfift till harveft, reduce the feed to a very fmall quantity: but numbers of accidents deftroy many of them. Our reafon ought therefore to tell us, that without deviating too much from the principles we adopt, we may, and fhould, judicioufly ftock our land with a fufficient number of plants, in order to guard againft unavoidable accidents.

"Still I may be afked, what is the fufficient quantity? I anfwer, that our experiment fhews that fowing fix grains together in a clufter, at the diftance of fix inches from each other, all the length of the rows, will not be found too thick. By following this rule, we may be almoft certain that the whole ground will be ftocked with a proper number of plants. This ought, however, to be looked upon only as a general propofition, which it will be often proper to deviate from in the circumftances we are going to mention,

"When the fowing feafon is favourable.

"When the land is well prepared.

"In countries where the winter is feldom fevere.

"When the land is but little liable to infects.

"When the land is not in danger of being hurt by too much drought, or too much wet.

"And laftly,

"When the land is good, and very fertile.

"In all thefe and fuch like cafes, lefs feed fhould be fowed; and, in the contrary cafes, more. Prudence, and a careful ftudy of the nature of the foil, ought to be our guides. Two or three years experience will be fufficient to fhew us the practice that will be beft to follow.

"It will be right to repeat our laft mentioned experiment, and even to vary it. In all probability it will afford us ftill greater lights. It will be right, for example, to fow the clufters with a greater number of grains, beginning with fix, the produce of which is known, and going on to feven, eight, or even more, always in clufters, till we come to a number at which the crop ceafes to yield an equal profit. By this means the two extremes may be known, either of too much, or too little feed; and the juft proportion will then be eafily determined.

"Some farther alterations may likewife be made in this experiment. For example, I placed the grains in the earth fo that they touched one another; they may be placed at fome little diftance, and ranged in a kind of circle of about three inches diameter. It is reafonable to think, that the plants may then make a greater progrefs, as they will not all have one common center: fome of them will be nearer the ploughed alley; their roots will reach it more eafily than before, and will multiply there; which may render the plants more vigorous." *Du Hamel's Culture des Terres, tom.* IV.

CLUSTER-GRAPE, the fmall black grape, generally called the currant.

COAL, the common foffile fuel.

COAL-ASHES. *See the article Coal*-ASHES.

COAL-BALLS, a compofition of culm, or the duft and refufe of pit-coal, mixed up with mud, clay, &c. burnt as fuel.

About Briftol, Briflington, and other places in the weft of England, they commonly make coal-balls of their culm, or fmall refufe-coal, which would not otherwife be faleable.

The method of making thefe balls is, to take a certain quantity of the culm, and an equal quantity of fleech, or mud left by the tide on the fea-fhore: thefe ingredients are firft mixed grofsly with fhovels, and then blended more perfectly with the hand: after which they are moulded into balls of about fix inches diameter.

Thefe balls may either be burnt immediately as foon as they are made, or laid up and kept as long as the owner pleafes, without fuffering the leaft damage.

The inhabitants of Croken-pill, near King Road, about feven miles below Briftol, are fuppofed to make them in the greateft perfection. They feldom ufe any other fuel, and find it anfwers extremely well, being much cheaper than coal, making as good a fire, and lafting longer.

They

They make it a rule to work as much culm into the fleech with their hands, when they mould the balls, as they poffibly can, without making them crumbly.

Thefe balls have not been ufed above thirty or forty years in the above parts; but are now greatly preferred, though they can have coals laid in at three-pence half-penny the bufhel.

In Wales, where thefe coal-balls are alfo made, they ufe clay inftead of the fleech, allowing two parts of culm to one of clay, adding to the heap a fufficient quantity of water, which they temper with it, in the fame manner as if they were making mortar with lime and fand. And after the culm and clay have been fufficiently mixed and tempered together, they form the whole into balls, in the manner above related.

The balls made with clay are not fo pleafant a fuel as thofe made about Briftol with fleech, becaufe the clay is apt to emit a ftinking fmoke, efpecially if the balls are burnt before they are dry; but notwithftanding this inconvenience, which the lower fort of people little regard, they afford the poor a good and cheap fuel.

It is furprizing that fome work of this kind is not undertaken in the neighbourhood of London, as it would greatly tend to leffen the enormous expence to which the poor of the metropolis are every winter fubject, for fuel; and could not fail of rewarding the undertaker for his trouble. Culm might be imported into the Thames very cheap, and nothing could be more fuitable than the river mud to mix with it, in order to form the balls; it would, probably, do better than the fleech, being of a richer, and more combuftible nature.

COAL-SOOT, the foot collected in chimnies, &c. where coals are burnt. A correfpondent of the editors of the Mufeum Rufticum has obliged the world with fome ufeful obfervations on coal-foot as a manure. He obferves that many farmers in fome countries are at a great lofs to find a proper dreffing for their meadows; and to fuch he recommends the ufe of coal-foot, as highly profitable and advantageous; its effects will be very vifible for upwards of three years, during which time no other manure need be laid on the land.

" Coal-foot, fays he, is of a very warm refrefhing nature: it cherifhes, and gives nourifhment to the grafs; it kills the noxious infects that infeft the crop, and protects it from the effects of frofts, fnows, and chilling rains; and, what is ftill of greater confequence, it will kill the mofs that fo often abounds in four meadows.

" I muft not however fail noticing, that foot will not have thefe good effects if the meadow-land fhould be fo damp as to require draining: in this cafe, cuts muft be made acrofs it, in proper directions, previous to the laying on the coal-foot, which would otherwife be of little fervice.

" All rank weeds fhould be carefully grubbed up from among the grafs, and that before they have perfected their feeds; without which precaution, in point of time, the work would be to do over again.

" The general quantity I lay on an acre of meadow-land is twenty-five loofe bufhels: more I find to be rather prejudicial, and lefs does not anfwer all the purpofes we are to expect from this excellent manure.

" The beft time for applying this dreffing, I take to be the beginning of the fpring: about February is the time I generally lay it on; the gentle rains which then, for the moft part, enfue, wafh it into the land, and the following crop is greatly benefited by it. This is very foon vifible from the fine deep verdure which the grafs affumes.

" Some of my meadow-land is particularly fubject to be damaged by frofts, fnows, &c. on this I generally lay the proper quantity of foot in the beginning of November; and fometimes, if the winter is likely to be fevere, I venture to allow thirty bufhels to an acre, which in other cafes I never do.

" Having myfelf found great benefit by ufing this coal-foot as a manure for meadows, I am willing my brother farmers fhould know it, that they may have it in their power to adopt the practice, if they approve of it.

" It will be well worth their while, provided they can have it at a reafonable rate, which they may, if they do not live more than twenty miles from London, by land-carriage, and wherever there is a communication by water, though at almoft ever fo great a diftance.

" Other great towns alfo, where fea or pit-coal is burnt, may fupply the farmers with it; but the misfortune is, that where it is in the greateft plenty, they leaft know the ufe of it.

" Great care however fhould be taken to get it genuine and good, the merchant chimney-fweepers, frequently to increafe the bulk, mixing the fine fifted coal-afhes with it: this is a great fraud, but may eafily enough, with proper care and circumfpection, be difcovered; for the afhes make the foot gritty, and increafe its weight in a very fenfible degree.

" Before I conclude, I muft give my brother farmers a caution; which is, that they never lay the foot on their land in windy weather, as not only great part of it will be loft and wafted, but the remainder will be fo unequally difpofed, as to do rather more harm than good." *Mufeum Rufticum, vol.* I. *pag.* 218.

Coal-foot is alfo an excellent dreffing for green wheat in February; it fhould be fown by hand, in quantity fufficient to blacken the ground. This is frequently practifed in Leicefterfhire, and many other counties. It is of a warm nature, and therefore does moft good on cold, moift, clayey foils.

COB, a wicker bafket to carry on the arm. Hence a feed-cob, or feed-lip, is a bafket for fowing.

COCCIFEROUS *Plants*, fuch as bear berries.

COCK, the male to the hen; alfo the male of any fmall birds.

COCKEREL, a young cock.

COCKLE, the fame with darnel-grafs. *See* DARNEL-GRASS.

COCKSCOMB, a very elegant fpecies of the amaranthus, cultivated in curious gardens for its beauty. The culture of this beautiful plant is the fame with that of the amaranthus. *See* AMARANTHUS.

CODLING, a well known fpecies of apple. *See the article* APPLE.

COFFIN, that part of the horn or hoof of a horfe which appears when he has his foot fet on the ground.

COFFIN-BONE, that bone which lies within a horfe's hoof as in a coffin.

This bone is round upwards, where it receives the little paftern, but grows broader and thinner towards its bottom; it is of a porous open contexture, like a piece of loaf fugar, and is eafily pierced, and often wounded when horfes happen to take up nails or other fharp bodies in the ftreets or roads: accidents to which they are often liable, and are more eafily cured than they would have been, had the bone been hard and folid.

COFFIN-JOINT, that where the leffer paftern joins the foot.

When the coffin-joint is ftrained, a horfe often continues a long time lame, without the owner's difcovering where the lamenefs lies; becaufe a horfe does not, at firft, favour it much on the bending of the foot, only in planting his foot upon the ground: but in time there will grow fuch a ftiffnefs in that joint, that he will only touch the ground with his toe, and it will be impoffible to play the joint with one's hand. The only method of removing this ftiffnefs is bliftering and firing, which generally fucceeds, unlefs the ftiffnefs and contraction has been of long ftanding. *Gibfon's Farriery, vol.* II. *pag.* 372.

COKE, pit-coal, or fea-coal, charred. It is made by burning pit-coal in ovens conftructed for that purpofe, and extinguifhing the fire in the fame manner as is done for charcoal.

COLD, the name of a difeafe to which animals of almoft every kind, particularly horfes, are very fubject.

Colds are caufed by an obftruction of perfpiration: that is, the pores, or outlets of the fkin, are fo far fhut up, that the fteams of perfpirable matter are checked fo that they cannot pafs off in their ufual manner. The confequence of this is, they recoil on the blood, vitiate its quality, overfil the veffels, and affect the head, the glands or kernels of the neck and throat, the lungs, and other principal parts.

It

It would be endlefs to enumerate the various caufes of colds; the moft ufual are, riding horfes till they are hot, and fuffering them to ftand in that condition, where the air is cold and piercing; removing a horfe from a hot ftable to a cold one, and too fuddenly changing his cloathing: hence it is that horfes catch fevere colds after they come out of dealers hands; and by not being carefully rubbed down, when they come in hot, off journeys.

The figns of a horfe's catching cold, are a cough, heavinefs, and dulnefs, which affect him more or lefs in proportion to the feverity of it: the eyes are fometimes moift and watery, the kernels about the ears, and under the jaws fwell, the nofe gleets, and he rattles in his breathing; and when the cold is violent, the horfe will be feverifh, his flanks work, and he will both loath his hot-meat, and refufe his water. When thefe laft fymptoms are attended with a flimy mouth, ears and feet cold, and a great inward forenefs, there is danger of a bad fever.

But when the horfe coughs ftrong, fnorts after it, is but little off his ftomach, pricks up his ears, and moves brifkly in his ftall, dungs and ftales freely, his fkin feels kindly, and his coat does not ftare, he is in no danger, and there will be no occafion for medicines of any kind; but you fhould bleed him about two quarts, keep him warm, and give him feeds of fcalded bran, with as much warm water as he will drink, in order to dilute his blood.

If the diforder fhould increafe, the horfe fall hot, and refufe his meat, bleed him, if a ftrong one, two quarts more; and if you are not fatisfied, without giving medicines, avoid, as you would poifon, a farrier's drench; which is generally compofed of fome hot naufeous powders, given in a quantity of ale: which too often increafes the fever, by over-heating the blood, and palls the horfe's ftomach by its loathfomenefs. And inftead of it, infufe two ounces of annifeeds, with a dram of faffron, in a pint and a half of boiling water; pour off the clear, and diffolve in it four ounces of honey; to which may be added four fpoonfuls of fallad oil: this drink may be given every night; or one of the following balls, provided there is no fever; in which cafe, it always will be more eligible to give two or three ounces of nitre, or fal prunella, every day in his feeds, or water, till it is removed; but fhould the horfe be inclined to coftivenefs, remember that his body fhould be kept open by emollient clyfters, or cream of tartar diffolved in his water, to the quantity of three or four ounces a day.

Take of the frefh powders of annifeed, elicampane, carraway, liquorice, turmeric, and flour of brimftone, each three ounces; juice of liquorice four ounces, diffolved in a fufficient quantity of mountain; faffron powdered half an ounce, fallad-oil and honey each half a pound, oil of annifeed one ounce: mixed together with wheat-flour enough to make them into a pafte.

Or, Take the following from Dr. Brachen.

Take annifeed, carraway-feed, and greater cardamoms, finely powdered, of each one ounce, flour of brimftone two ounces, turmeric in fine powder one ounce and a half, faffron two drams, Spanifh juice diffolved in water, two ounces, oil of annifeed half an ounce, liquorice-powder one ounce and a half, wheat-flour, a fufficient quantity, to make into a ftiff pafte, by beating all the ingredients well in a mortar.

Thefe balls confift of warm opening ingredients; and, given in fmall quantities, about the fize of a pullet's egg, will encourage a free perfpiration; but, in cafe of a fever, fhould be cautioufly continued. They are much more efficacious, and in all cafes fuperior to the farrier's drenches, if diffolved in a pint of warm ale.

This fimple method, with good nurfing and hot mafhes, warm water and cloathing, efpecially about the head and throat, which promotes the running at the noftrils, will anfwer in moft fudden colds; and when the horfe feeds heartily, and fnorts after coughing, moderate exercife every day will haften his recovery.

The fcalded bran fhould be put hot into the manger, for the fteams conduce not a little to promote a running at the nofe, which is often very plentiful, and greatly forwards the cure. His manger fhould be kept clean, by filling it with ftraw; his hay well fhook and fprinkled with water, and given in fmall quantities: for his breathing, at this time, taints the hay, and then he will not touch it.

To a horfe loaded with flefh, a rowel may fometimes be neceffary, as may alfo a gentle purge or two, to fome, when the diftemper is gone off. *Bartlet's Farriery, pag.* 26.

COLD-CHARGE, the name of a medicine much ufed by farriers for curing ftrains, &c. It confifts of vinegar, bole, and the whites of eggs, mixed together to the confiftence of a poultice, and fpread over the part hurt.

COLE, *or* RAPE, the name of a plant greatly cultivated, both on account of its feed, being that from whence the rape-oil is drawn; and alfo for feeding cattle. The botanifts call it *napus fylveftris*, or wild navew.

The marquis de Turbilli, who has done more fervice to agriculture than any other foreign writer, has lately publifhed a memoire on the culture of cole-feed, as practifed by the Flemifh farmers, to whom we are indebted for many valuable improvements in hufbandry.

In the piece above-mentioned, the marquis obferves, that all forts of cole-feed are cultivated in the fame manner; and that all grow more or lefs towards their natural perfection, yield more or lefs feed, and this feed is of a better or worfe quality, according to the nature of the foil on which the cole-feed is fown, the good or bad hufbandry beftowed on it, the favourablenefs of the feafon, and the manner in which it efcapes other accidents to which it is fubject.

Cole-feed, he fays, thrives beft in deep kindly foils; but with plenty of manure, and deep ploughing, it will grow any where. He adds, that he has feen it yield good crops on a dry chalky foil, on which ftreet dirt had been laid.

We muft obferve, that this is a very ufeful piece of knowledge to propagate, as we never yet heard of any farmer in England, who ventured to fow it on fuch a foil. This fhould be attended to by the Bedfordfhire farmers about Dunftable, &c.

Our noble hufbandman next remarks, that in Flanders cole-feed is fown and tranfplanted like cabbages: they give two ploughings to the land before winter; and it is not of much confequence what crop the land was laft under.

In the month of May another deep ploughing is given; the land is harrowed two or three times, and then rolled, in order to make it fine. Towards the eighteenth or twenty-fourth of July, it is again ploughed, harrowed, and rolled till it is reduced to as fine a tilth as poffible: the feed is then fown, being fcattered by the three fingers: the land is lightly harrowed, and afterwards rolled.

The marquis fays, that twenty-four pounds of feed will fow three acres, and the plants on thefe three acres will fill twelve others. Cole-feed is tranfplanted after any crop whatever.

The land intended to receive the cole-feed plants fhould be twice ploughed as foon as the crop is carried off. About ten or fifteen days afterwards it is to be once or twice harrowed, and towards the end of September it fhould have a very deep ploughing. In this laft ploughing there fhould be an open furrow or trench every five bouts. If the field does not lie level, it fhould be ploughed obliquely, fo that there may be an eafy fall for the water.

The beft and moft promifing plants being taken up, and tied in bunches, are carried to the field where they are to be tranfplanted, by the time the laft ploughing is completed, and the workmen are ready for them.

There will always remain a number of plants in the land where they were fown: thefe are generally fed off with cattle; for the farmers never let them ftand to ripen their feeds, unlefs they intend to manure the land for the fucceeding crop.

The feafon in Flanders for tranfplanting cole-feed is the beginning of October. The plants are placed in rows acrofs the furrows. The rows are one foot afunder,

der, and the plants in the rows about fix inches diftance one from the other. The manner in which this work is done is as follows. A certain number of men advance in a parallel line, each having a dibble, or fpade-handle, with two large iron points to it, fix inches afunder: they drive this inftrument into the ground; the women and children follow, who put a plant into every hole, and fettle it at the fame time; which is eafy enough to do, and it faves fome expence.

When all the cole-feed is planted, if the land to which it was removed was not dunged before it was ploughed, it muft be fown with pigeons dung reduced to powder: this, of all other manures whatever, has the moft immediate and proper effect on the vegetation of this plant; fixty bufhels are enough for two acres.

When this is done, the loofe earth in the trenches, or open furrows, is to be thrown with a fhovel amongft the plants in the rows. Early in the fpring, a fpit of earth out of the trenches is, in like manner, to be caft amongft the plants of cole-feed in the rows. This flight tillage gives vigour to the crop, choaks the weeds, and keeps the foil loofe.

The rows of cole-feed form a number of beds, and when it thrives well, the trenches are entirely covered, and the whole refembles a thick copfe.

Here the marquis obferves that cole-feed thrives perfectly well in new-enclofed lands.

The feed is fit to gather about the beginning of July. When it turns yellow, it is reaped like corn, and laid in pretty large gavels on the beds, where it remains three or four days; it is then carried in cloths, in order to prevent any of the feed from being loft, for it is very ready to drop.

In one, or feveral parts of the field, in proportion to its extent, and to the quantity of cole-feed there is, the crop is formed into feveral ftacks. The Flemifh farmers never thatch thefe ftacks; they know fo well how to make them, that the rain does them no damage. The cole-feed heats in the mow, by that means yielding more oil than it would have done, if it had not been ftacked.

In the month of September they make a kind of floor in the field, whereon they threfh and drefs their cole-feed. If a farmer fhould incline to threfh his cole-feed without ftacking, it will be neceffary for him to leave the gavels longer expofed to the air on the beds. Cole-feed may be cut at any time of the day, provided it does not fhed; if it does, it fhould only be cut mornings and evenings. As a whole field does not all ripen at the fame time, it fhould be cut in different portions; being laid in gavels, or heaps, the changes of weather will not affect it. It may fafely be ftacked three or four hours after rain, provided it has previoufly been fome time in gavels, and is judged fufficiently dry.

In order to clean the feed, parchment fieves are ufed, if there is any wind ftirring; but if it be calm, they ufe wind-fans.

Cole-feed fhould not be fown on the fame land above once in five or fix years.

In the neighbourhood of Clermont, in Beauvoifis, the marquis tells us, that they let the cole-feed ripen in the field where it was firft fown; but if they confidered that cole-feed is not fond of moifture, that it fends forth large roots into the earth, and grows to a great height, with numerous wide extended branches, they would be fenfible that the land, being covered with too many plants, muft be impoverifhed; and that plants, which ftand fo clofe together, cannot attain their full fize: thus, in this way, the land is impoverifhed, the weeds are left to perfect and fhed their feeds in it, and not only the crop of cole-feed is very indifferent, but alfo the crops which fucceed it. In order to reftore fuch land to a good condition, it fhould be well manured and fallowed.

Cole-feed extracts fuch a quantity of falts from the earth, that the Flemifh farmers tranfplant it, as well to divide betwixt two pieces of land the loffes in point of quality it occafions to the foil, as to procure better crops. For both thefe reafons, they alfo fometimes tranfplant their cole-feed on land newly broke up.

In the country of Amiens they tranfplant their cole-feed after the plough in clofe furrows: this method is better than that above-mentioned; but it is greatly inferior to the Flemifh method; for the rows are difordered, and the plants crufhed by the horfes feet; and having, befides, no frefh earth laid on them, they cannot grow to fuch fine plants; and, on the other hand, the earth, which is not kept ftirring, cannot receive any confiderable benefit from the influences of the air.

The marquis obferves, that there is, however, a cafe in which this method muft be reforted to; which is, when the plants are grown fo tall, and have fuch long roots, that proper holes cannot well be made for them with a dibble, they fhould be laid in the furrows after the plough, and open furrows, or trenches, fhould be left at the diftances already mentioned; but the earth from thefe trenches is with greater difficulty thrown on the beds, becaufe the cole-feed, in this method, is planted lengthwife, whereas, in the other method of tranfplanting, the plants crofs the beds.

In this effay the marquis de Turbilli relates a very curious fact, which we fhall infert in his own words:

" In the year 1755, I faw, in the neighbourhood of Guife, in France, fome cole-feed tranfplanted into a field, containing about eighteen acres, which had always borne fine corn, but had no great depth of foil.

" At the depth of feven or eight inches from the furface lay a bed of red clay, which the farmers are fo much afraid of mixing with their good earth. This land was firft well dunged, and when the cole-feed was tranfplanted, the red earth out of the trenches was thrown on the beds.

" All the inhabitants of the country flocked to fee this work executed, which was under the direction of a Flemifh farmer. They pretended that he fpoiled the land, and that no corn would grow on it afterwards.

" However, during the courfe of the winter, the red clay became mellow; the rains, which wafhed the dung, ran into the trenches, carrying with it a fediment, and a portion of falts, improving the earth that was in the enfuing fpring to be thrown on the beds amongft the rows of cole-feed, which came on amazingly.

" At the harvefting of the next crop, the inhabitants did not fail coming to fee what fort of corn fucceeded the cole-feed; and being perfectly well convinced that it was much finer than the land was accuftomed to bear, they laid afide their prejudices, and adopted the planting of cole-feed. In the year 1761, there were in that fingle quarter above one hundred acres of tranfplanted cole-feed."

Muft we not, on fuch good authority, allow that the notion of the under-turf earth being poifonous is ideal? If indifcreetly laid over the furface of the land when it either is, or is to be fown, under certain crops, it may be prejudicial, and fo may the beft practices in hufbandry, if injudicioufly followed.

A correfpondent of the editors of the Mufeum Rufticum has given us the following method of cultivating cole-feed in Effex. He begins with obferving, that the great confumption of rape-oil in that country in manufactures, together with the natural richnefs of their land, induces them often to fow the cole-feed or rape-feed, which thrives there extremely well.

" In moift foils, continues he, we fow it on four-bout lands, the large furrows between the ridges ferving to drain off the water.

" We do not truft to the richnefs of our land alone, for we almoft always lay on a confiderable quantity of manure; being of opinion that land cannot be in too good heart for this plant, which requires a great deal of nourifhment, having a very luxuriant growth, and draining the land much: for this reafon, it is in vain to attempt fowing it on poor, hungry, dry foils, on which it will never thrive, nor turn to profit.

" Land cannot be too mellow, nor too much pulverized, for the cole-feed plant; for it not only requires a rich foil, but alfo the land muft be in excellent tilth: we allow land, on which it is to be fown, fometimes three or four ploughings, according to the nature of the foil; if ftiff, it requires more tillage; if a loofe, rich, crumbly loom, lefs ploughing will do.

" In July we harrow the field over, and afterwards fow on it half a peck of feed to the acre broad-caft. As foon as the plant gets out of its feed-leaf, I hoe it as I do do my turnips, thinking this a better way than to let it grow rambling without after culture, as some of my neighbours do.

"This crop is, without care, very apt to be destroyed by slugs, whilst the leaf is young and tender; but to prevent this, I always strew over the young plants a mixture of slaked lime and wood-ashes: about ten bushels of slaked lime, and fifteen of the ashes, will be quite sufficient for an acre: this is the quantity I use.

"I find great benefit from this practice, as it not only burns up the slug, and destroys many pernicious insects, but also greatly helps to forward the crop, insomuch that it gets to a strong head before winter, and yields me plenty of fodder for my cows, sheep, &c.

"A part of my ground will sometimes unaccountably fail; that is, the seeds will not come up; but as the cole-seed plant bears transplanting extremely well, I make my men remove some of the plants, where they stand too thick, to supply the deficiencies: these are sure to take, especially if rain ensues: if it does not, I cause them to be watered, which is soon done, as they seldom fail in great quantities.

"The cole-seed plant is so hardy, that it bears, without injury, the frosts of our severest winters; but the north-easterly winds, if very cold and piercing, will sometimes greatly injure a crop, and there is no guarding against these.

"We sometimes in this county sow cole-seed merely for the sake of the winter feed it affords our cattle; in which case we plough it up early in the spring, and are almost sure of a good crop of sound barley. This is not generally practised, because it requires great care to clear the land of the cole-seed plant, which would otherwise grow up with the barley, and injure it; I, however, and some others, have often practised it to advantage.

"One thing I must observe before I conclude, which is, that cattle must be fed with this plant with great care, or it will have fatal effects: it is best to give them with it, at times, sweet dry hay: this corrects the superabundant moisture of the plants, and serves to dry up the uncorrected and raw juices that would otherwise mix with the mass of blood in the cattle: suckling ewes may feed on it heartily, however, with very little danger; and, in fact, experience will soon direct the young farmer in the management of his cattle in this respect.

"We reap, for the most part, our crops of cole-seed; and as it is very apt to shed, we prepare frames lined with threshing cloths, each drawn by one horse, to receive the heads of the plants as fast as they are cut off.

"When this crop is properly managed, nothing pays better." *Museum Rusticum, vol.* I. *pag.* 237.

Another correspondent of the editors of the above work, gives us the following method of cultivating cole-seed in the fen countries.

He observes, that they make use of no muck or compost, but have recourse to the method of burn-baking, which we have already described under that article. *See* BURN-BAKING.

As soon as the land is burnt, and the ashes spread, it is immediately ploughed, and the seed is sown as soon as possible.

"The quantity we sow, continues he, on an acre is about half a peck, or rather less: it would be proper to draw a light hurdle, stuck with thorn spray, over it, by way of prevention against the fowls. We plough the lands about ten paces wide, that the furrows may carry the water off, where the land lies on a little descent.

"There is one thing to be observed in the ploughing, if the square of the piece will admit of it: you should plough for burning from east to west, and when you plough for sowing, then plough north and south, for these reasons: first, the land will break better for being cross-ploughed; and then the land, when sown, will lie as it were full face to the sun; but this cannot always be done.

"As soon as the cole-seed begins to sprout, it is often all destroyed with what we call a black fly; an insect so small, and being black, the same colour of the land, that it is almost impossible to see it, otherwise than as you walk among the seed, if you look steadily, you will perceive something hop or fly off, like the hopping of a flea: I have very often endeavoured to discover what sort of fly this is, but never could find one, though they will find the seed immediately on its first sprouting.

"It has many more enemies as it advances in its growth: the next is what we call the black canker; it is a small black worm, about a quarter of an inch long, or rather more: this takes possession when it is about the size of a small cabbage-plant, but windy and rainy weather are great helps to the destroying that insect.

"There is yet another enemy, but he appears in a different dress: this is the green caterpillar, more than an inch long, but does not appear till about the latter end of September, and very often destroys a great deal of it; but the frosty mornings generally dispatch him.

"I have now gone through the various steps of the culture of cole-seed to this particular period, with a supposition that we have escaped all those dangers. I will now give you a short sketch how we proceed when we are attacked with those enemies above-mentioned.

"If the small fly eat the first sprout, it is usual to sow the land again; but I would advise the farmer, before he sows, to harrow the land with a light harrow with wooden teeth; for if the harrow be heavy, it will tear up the furrows: my design in this is to raise a fresh mould, by which means the seed will strike much sooner than if nothing was done to it.

"As to the black canker, the only method I can advise is, to let two men take a waggon-rope, each take one end, and draw it over the plant about twice in a place, by which means the canker will be beaten off the plant on to the ground, which seldom rises again.

"As to the green caterpillar, the same expedient, I believe, would be of service to that; but, as I have said before, we are chiefly relieved from it by frosty mornings."

The writer then proceeds to give his readers an account of the uses the cole-seed is put to in the fen countries, when the plant is arrived to its utmost perfection.

"We eat off, says he, with sheep that are about half or three parts fat, to make them fit for the butcher; for cole-seed is the most fattening food for sheep that is known in this part of the world, greatly exceeding turnips, as a sheep will thrive more at cole-seed in one month than it will at turnips in two.

"The usual time of putting them into the seed is about Michaelmas: however, that depends upon the farmer's own conveniency; but if the sheep are poorer than as above described, they must be put in sooner. We generally manage so as to have the seed eaten off by about Old Candlemas, for this reason; if the land be stout and good, there is a chance for the seed to stand for a crop.

"If the farmer finds the seed good enough to stand for a crop, I would advise him, if the stumps or stalks be left high, as where the cole-seed is strong and good is mostly three or four inches off the ground; otherwise he will find his crop will receive great damage by the stumps being left very shagged and torn, which lets in the wet, and rots abundance of them; and even those that do grow have not the vigour as those have that are mowed; for the former is, at it were, spread to the snow and rain, while the latter is wholly secured from them both, and will support the sprouts, that shoot out at the sides, with strength and vigour.

"Cole-seed is a plant that will shed or shale its seed very greatly, if it is not reaped in proper time; from which great losses have been known, where the farmer has thoughtlessly let it stand too long before he begins to reap.

"If the season has been kind, that the crop comes on all together, though we often see the contrary, the farmer is, in either of these cases, as soon as he perceives any part of it to turn brownish, to begin to cut, notwithstanding the generality of the seed will be green; but if you let the whole stand till the last becomes brown, like the first, the first part will be entirely lost.

"But it will perhaps be said, should not the latter part be as ripe as the first? My reply is, as cole-seed is a small a fmall feed, and the ftalks on which it grows are very large, the ftalk will feed that part that is green, after it is reaped, fo as that of the latter will be nearly equal to the firft; by which means both are faved.

"There is a particular method of laying it on the ground, when reaped, different from all other crops; for inftance, fuppofe the people reaping a field from north to fouth, every two men fhould lay in his reaps, with the heads of the feed to each other, but not to touch, the heads and the ends of the ftalks lying eaft and weft. We fhall now proceed to the threfhing.

"The diftance of time between reaping and threfhing depends fo entirely upon the weather, that it is impoffible to give particular directions in that matter, otherwife than that when the feed has lain till the ftalk or ftraw is dead, and turned white, and the feed, fome of it being rubbed out of the cofh, or pod, appears black and plump, and does readily come out, then is the time to begin to threfh.

"Though the bottom of the reaps will be a little greenifh, they muft be not turned to weather the under fide; if you do, it will brufh out a great deal of the top fide: and if the weather fhould prove wet in the time it is threfhing, even in that cafe it muft be turned, but raifed up gently and laid lightly on the ftubs; in that fituation it will dry apace.

"It is always threfhed in the field, upon a cloth about twenty yards long, and eighteen yards wide. To defcribe each perfon's employment, I think, it is not to be done, fo that a perfon that never faw it can have an idea of it; but as it is, I think, if every perfon concerned in a cole-feed fale, for that is the name we give the cloth and people when at work, be clever in their places, a curious piece of mechanifm, if I may be allowed the expreffion, where men and women are made ufe of inftead of wheels and pullies.

"The number of people employed at a cole-feed fale are, generally, about twenty: feven gatherers; thefe are women, great boys and girls: I have faid feven; but where the crop is thin, it requires more, fometimes eight or ten, or more; but where the crop is thick, a lefs number may do; thefe people gather the reaps up with a fickle, for, as their arms cannot reach round the reaps, they would fqueeze it together, and brufh a deal of feed out, if they had no fickle: they put it into a fheet called a bearing-fheet, of which there are two belonging to every fale; it is about ten feet long, and about feven feet wide, and has loops on each fide, through which a light pole is put, and is carried, when filled, by two men to the cloth: thefe are called the bearers.

"When the feed is lain on the cloth, there is a man called the layer-on: he with a fickle lays it on a row, acrofs the cloth, for the threfhers, which are four, two on each fide the row of feed. While the threfhers are threfhing the firft row, or floor, the layer-on lays on another row at a proper diftance from the other: when they have threfhed the fecond once over, they turn to the firft, and threfh it all a fecond time: they have then done their parts: there are two men called fhakers off, that immediately follow the threfhers: the firft of them throws the cole-feed ftraw up; the other ftrikes it as it rifes, which helps to knock out what feed may be left: thefe two men, with wooden forks for that purpofe, convey the ftraw off the cloth, over the bolfter, to a perfon that takes it away; he is called the fack-ftraw.

"After the fhakers off, come two perfons, one of them a woman: they take off the cofhes or pods, and fhort broken ftraws, with rakes made for that purpofe: thefe are called the before and behind cavers. The behind caver muft be a perfon of ftrength and activity, in order to do his work as it ought to be done; for upon him the faving or throwing away of a good deal of the feed depends; fo that he fhould be a nimble brifk fellow, and careful too, or he is by no means fit for that place.

"If there be a good crop, and the plants yield well, the weather bright, and the feed threfh eafy, thirty combs, or one hundred and twenty bufhels, may be threfhed in the day; but fometimes not more than ten or twelve combs.

"Early the next morning the four threfhers throw the feed upon the cloth, when the farmer comes with facks and a waggon, and takes it away, fo that the cloth is cleared and ready againft the people come to work." *Mufeum Rufticum, vol.* I. *p.* 418, *and vol.* II. *pag.* 79.

If this plant be fown for the food of cattle, they will be large enough for feeding by the middle of November, when, if there be a fcarcity of other fodder, this may be eat; but if there be not an immediate want of food, it had better be kept as a referve for hard weather, or fpring feed, when there may be a fcarcity of other green food. If the heads of thefe plants are cut off, they will fhoot again early in the fpring, and produce a good fecond crop in April, which may be either ufed for cattle, or fuffered to run to feed. It is fo hardy as not to be deftroyed by froft, and therefore of great ufe in hard fevere winters, for feeding of ewes: for when the ground is fo hard frozen that turnips cannot be taken up, thefe plants may be eat for a conftant fupply. Mr. Miller fays, he has found, in feveral places where he has fowed this feed, that one acre of land planted with cole will produce nearly as much food as two acres of turnips; that this will afford late food after the turnips are run to feed; and that, if the plants are permitted to ftand for feed, one acre will produce as much as, at a moderate computation, will fell for five pounds, clear of charges.

Partridges, pheafants, turkeys, and moft other fowls, are fo fond of thefe plants, that, if there be any of them in the neighbourhood of the field where they are cultivated, they will flock thither, and lie conftantly among them.

The cakes of cole-feed, which remain after the oil is extracted, are exceeding good food for cattle, and will very foon fatten them. They are indeed apt to render the fat of fuch beafts yellow and rank; but this may be eafily removed by feeding them with dry fodder a fortnight or three weeks before they are killed.

COLE, *Cale*, or *Keal*, fignifies pottage in the northern parts of England and Scotland.

COLEWORT, or *Dorfetfhire-Kale*, is a fpecies of cabbage, formerly much cultivated in gardens, but at prefent little known, cabbage-plants being fubftituted in its room. It is however a very ufeful plant for feeding milch-cattle in the fpring, when there is a fcarcity of herbage; for it is fo hardy that no froft will kill it.

The beft method of cultivating this plant in the fields is, to fow the feeds about the beginning of July, choofing a moift feafon, which will bring up the plants in about ten or fourteen days: the quantity of feed for an acre of land is nine pounds. When the plants have got five or fix leaves, they fhould be hoed in the fame manner as turnips, cutting down all the weeds from among the plants, and alfo thinning the plants where they are too thick; but they fhould be kept thicker than turnips, becaufe they are in more danger of being deftroyed by the fly: this work fhould be performed in dry weather, that the weeds may be killed. About fix weeks after the plants fhould have a fecond hoeing, which, if carefully performed in dry weather, will entirely deftroy the weeds, and make the ground clean, fo that they will require no farther culture. In the fpring they may either be drawn up, and carried out to feed the cattle, or the beafts may be turned into the field to feed upon them as they ftand; but the former method fhould be preferred, becaufe there will then be little wafte; whereas, when the cattle are turned in among the plants, they will tread down and deftroy more than they eat, efpecially if they are not fenced off by hurdles. *Miller's Gard. Dict.*

COLLAR, the part of the harnefs that goes round a horfe's neck.

COLLAR *of brawn*, is the quantity of brawn bound up in one parcel.

COLLATERAL *Bee-Boxes*. *See the article* BEE.

COLLEY *Sheep*, fuch fheep as have black faces and legs. The wool of thefe fheep is very harfh, with hairs, and not fo white as that of other fheep.

COLLIFLOWER. *See the article* CAULIFLOWER.

COLONY, a number of people drawn from the mother country, to inhabit a diftant place. And hence the ingenious

ingenious Mr. White has applied the word to a flock of bees. *See* BEE.

COLT, a foal, or young horse.

Foals are separated from their dams after five, six, or at farthest seven months; experience having shewn, that such as are suffered to suck ten or eleven months, though usually larger and fuller of flesh, are not equal, in other respects, to those that are taken away sooner. After living six or seven months on milk, they are habituated to a more solid nourishment, having bran given them twice a day, with a small quantity of hay, which is increased as they advance in age, and in this manner they are kept in the stable, as long as they express any desire of returning to their dams: but when this uneasiness is over, they are turned into the fields, taking care never to do it fasting. An hour before they are turned to grass, a feed of bran, and some water should be given them; nor should they be exposed to either severe cold or rain: in this manner the first winter must be passed. In May following, they must not only be turned into the fields every day, but may lie in the open air till the end of October, taking care not to let them feed on the after-math; for by accustoming themselves to this remarkably delicate and succulent grass, they would contract a dislike to hay, which, together with bran mixed with barley and oats ground, should be their principal food during the second winter. In this manner they are to be kept till their fourth year, spending the days only in the pastures, during the winter; but both day and night in the summer. When they reach that age, they are to be taken from the pastures, and fed with dry meat; but in this change of food some precautions are requisite; as during the first week to feed them only with straw, and give them proper medicines against worms, which often trouble them from bad digestions and too rank grass.

At weaning young colts, they should be kept in a clean stable, not over warm, which would render them tender, and too sensible of the impressions of the air. They must frequently have fresh litter, and be rubbed often with straw; but not tied nor curried till they are three, or at least two years and a half old; for the roughness of this friction would give them pain, and their skin being too tender to endure it, instead of thriving, they would fall away. The rack and manger should not be too high, lest the necessity of lifting up their heads to reach their food, should occasion them to carry their heads in that manner, which would spoil their chests. When they are a year, or a year and a half old, the hair on their tails should be cut, as the succeeding growth will be stronger and thicker than the former. When they are two years old, they should be separated, and the fillies with the mares, otherwise the former would fruitlessly weaken themselves with the latter. At the age of three years, or three and a half, they should be broke, and rendered docile. In order to this, a light easy saddle should be put on their backs, and continue there three or four hours every day. They should also be used to receive the bit of a small bridle into their mouths, and suffer their feet to be taken up, and some strokes given on the sole, as if shoeing them. If they are designed for draught horses, a harness should be put on their bodies, and afterwards a snaffle bridle should be added. They should then be trotted on level ground, but without a rider, the person only holding the reins, and either the saddle or harness on their backs: and when the saddle-horse easily turns, and freely comes up to him that holds the rein, he should mount on his back, and dismount again immediately, without riding him, till he is four years old, as before that time the weight would be too much for him: but at four years old he may be ridden, and trotted at small intervals. *Buffon's Histoire Naturelle, tom* IV.

COLT-EVIL, a distemper to which young horses are subject, consisting of a swelling in the sheath, occasioned by their having full liberty with the mares before they are able to cover them.

This disease may be easily removed at the beginning, by the use of warm fomentations, made of emollient herbs, &c. but if the swelling be hard and inflamed, bleeding and purging are both necessary; and it may also be proper to tie his yard up to his belly, making a hole for his water to pass free. *Gibson's Farriery, vol.* II. *page* 168.

COLTS-FOOT, *fole-foot*, *horse-hoof*, or *bull-foot*, the name of a very common weed, whose scaly stalks arise in February, bearing one yellow compound flower, which is succeeded by a hairy white down. The leaves come out later. They are shaped somewhat like a horse's hoof, and are downy underneath.

This weed, which delights to grow by the side of rivers, increases so fast by its seeds and rambling roots, every piece of which last will produce a new plant, though they have been broken by the plough, that it cannot be extirpated without much difficulty, and a considerable time. Carefully pulling up the roots every time the earth is stirred, or the least vestige of the plant appears, and preventing its running to seed, are the most effectual means of destroying it in arable land; and this is best accomplished by the horse-hoeing husbandry: but totally to extirpate it, the ground must be laid down long to grass. One of Mr. Lisle's neighbours almost destroyed it by two successive crops of vetches; and he himself is clearly of opinion, that it may be killed by letting the land lie a sufficient time under clover, or rye-grass; because, says he, the roots of the natural grass matting more and more every year, will, in five or six years, so bind the surface of the ground, that the colts foot will not be able to pierce through it, and will therefore die for want of air. He ploughed up broad clover in the beginning of July, and turned up the roots of colt's-foot, in which he observed, between earth and air, many little buds, shot forth, of the bigness of the mid-summer buds in fruit-trees, probably to be the leaves or flowers of the next year; and at the depth of five, six, and even seven inches, he remarked here and there a shoot, of a callous body, like the root itself, from one to four inches long; perhaps destined to be future roots: he experienced that a winter's fallow will not destroy these roots, and that they cannot resist the effect of summer fallows, in which they are turned up, and exposed dry to the sun. It is therefore necessary to pick them as clean as possible, and burn them: for it is not to be supposed, that all the roots which are turned up in a summer fallow will wither of themselves: on the contrary, such of the buds at the joints of these as are buried under ground, will shoot out again if much rain falls, or the season be wet.

COMB, a measure of corn, consisting of four Winchester bushels; but in the fen country the comb generally consists of four bushels, and each bushel of eight gallons and a quart.

COMMON, an open piece of ground used equally by many persons.

The marquis of Turbilli has treated the subject of breaking up commons and waste grounds in so masterly a manner, that it will be necessary to give the substance of what he has advanced on this interesting subject, nearly in his own words.

" Upon the death of my father, says the marquis, which happened in the year 1737, I inherited the lands of Anjou, of which I am now going to speak. They lie contiguous, and form a pretty considerable extent.

" Hills and vales render the country uneven in many places; though, in others, there are spacious plains, with several brooks, and a small river. The soil is of three kinds, bad, middling, and good; but this last is least frequent. Most of the lands, being of a middling quality, are fertilized only by dint of care and manure: wheat grows on one spot, meslin on another, rye on a third; and sometimes it is necessary to sow these three different sorts of grain in the same field; so much does the soil vary: but, in general, we sow more ground with rye, than with any other corn. Buck-wheat, barley, oats, hemp, flax, and other equally useful productions are likewise cultivated in these parts. The vine prospers here very well, especially on the sunny side of banks and higher grounds: our wine, both red and white, is good; our fruit trees thrive well; and so does the white mulberry, of which I made large plantations some years ago. The oak, the elm, the beech, and other forest trees, grow extremely well in these lands. Such is the soil of this district: the climate is mild and temperate, as is the rest of Anjou.

"Three sides of this estate border upon immense tracts of uncultivated heaths, which spread through the greatest part of the province, and belong, some of them to the king, and others to different lords, ecclesiastical and temporal. However, the situation of my house, and of the chief village, is advantageous, being nearly in the center of the whole, and within about six miles of three pretty towns.

"Such was my estate when I took possession of it: not a quarter part of the land was cultivated, and even that very badly: the rest was either abandoned by the husbandmen, or had not been cultivated at all. Most of the meadows along the brooks and rivulets were become marshes, productive of scarce any thing but rushes. The vineyards were ruined, and the woods destroyed. A third part of the farms belonging to the principal parish where my seat is, were un-tenanted, for want of farmers to rent them. The inhabitants of this place were very poor, and did not, in general, raise corn enough of any kind to subsist them half the year: nay, such was their indolence, that they chose rather to stroll about and beg during the other half, than be at the pains of bestowing proper culture upon their land, which, with that culture, would have maintained them decently.

"This deplorable condition of my estate, which I have here represented fairly, without exaggerating any one particular, determined me, early in life, to read attentively all the most approved writers upon agriculture, and to observe carefully every improvement I met with in my travels. Even the campaigns in which I served did not interrupt these inquiries; for agriculture and arms never were by any means incompatible. Under these circumstances, I resolved to execute upon my own property, designs which my knowledge of the place, concern for the unhappy situation of its inhabitants, and regret to see what small returns were made by so large an extent of ground, naturally suggested.

"I plainly foresaw that this undertaking must be a work of time; neither my fortune, nor the number of hands I could procure in the country, allowing me to go beyond the clearing and improving of a certain space every year. Some gentlemen of knowledge, judgment, and public spirit, to whom I communicated my thoughts, approved of them, commended my design, and exhorted me strongly to carry it into execution; representing, besides the advantages which would necessarily accrue to me, the general benefit which such an example might be of to my country, filled, as it is, with numerous tracts of uncultivated land. This last reflection animated me more and more.

"My first care was, to endeavour to extirpate the spirit of indolence, and consequent love of begging, which prevailed among my peasants in general. To this end, I gave public notice of my intended improvements, with a declaration, that I would constantly employ every man, woman, or child above eight years of age, who might not have business of their own to do, on condition of their leaving off begging. At the same time I ordered an account to be taken of such as were not able to work. These I afterwards examined more particularly myself, and found among them several who, though they were not fit for hard labour, were capable of doing many useful things, in which I accordingly employed them. By this means, my list of really helpless people was reduced to a small number, which I provided for, till their relations should be able to keep them by means of what they earned from me. A few, and only a few, of these poor objects, who either had no relations, or such as in truth could not help them, became a dead charge: though this soon lessened, and is now inconsiderable.

"An innumerable multitude of rabbits infested my land. Against these I declared open war; being determined absolutely to destroy them. This has already been several years a-doing, and is not yet entirely completed. Some of them still remain, sheltered in their burrows at the foot of rising grounds, and others make incursions from the neighbouring woods and warrens. However, they do me no great mischief now; and even then I drove them from the place where I wanted to work.

"In the month of June 1737, I begun my improvements with clearing some of the land near my house. This ground was so poor that no farmer would even attempt to make any thing of it, served only to feed a few stinted cows, and was over-run with briars, thistles, and broom, which, being cut up, and laid in heaps, from space to space, were burnt upon the spot, and yielded a considerable quantity of ashes. These were then spread, and immediately turned in by a single plowing, lest their virtue should exhale. During the summer, this land was ploughed several times, different ways, in order to loosen it, and endeavour to destroy the weeds. I had bought for this purpose oxen, which are generally used for ploughing in Anjou; but my horses helped them, especially for harrowing. Here my poor peasants, men, women, and children, were employed to break the clods and pick off the stones; and as I had more dung than my arable lands required, I ordered about half the quantity that is generally used in other places, to be laid upon this ground, which was afterwards sowed at the usual time. This first trial succeeded, and the crop was very good; though most of my neighbours were of opinion that all my labour would be lost.

"In 1738, I undertook another piece of ground, adjoining to the former, and of the same kind. I began in March, proceeded as before, dunged it, and had equal success. The second crop of the former spot was still more plentiful. This summer I gave a thorough fallow to ten acres which had long been under corn, and sowed part of them with hemp and flax, for a purpose which will be mentioned hereafter. I likewise recruited my vineyard, and drained my meadows. Numbers of day-labourers were employed in cleansing the rivulet and brooks which run through them. In the winter of this year an accident happened, which had like to have overset my whole undertaking. The oxen which I used for ploughing, and which were grown lean, it was supposed through labour and fatigue, were on a sudden covered with vermin, which eat into their flesh: several remedies were applied, but in vain, the vermin re-appearing in a few days. We knew not to what cause to ascribe this disorder, which was destroying animals without whose assistance I could not proceed: besides which, the loss would, in itself, have been considerable. They had hitherto been fed with hay only; though the custom of the country was to mix it with an equal quantity of wheat-straw. As I had not yet a sufficiency of this last, I bought some, gave it to them mixed with hay, and allowed them oats from time to time when they had been hard worked. This mended them a little: but they did not recover entirely, or get rid of their vermin, till they fed on green grass, and lay out of doors.

"I begun this year to make new roads and causeys a-cross my meadows, marshes, and rising grounds, for the easier conveyance to and from my fields; the old ways being often impassable in many places. This has been a very long and expensive work; nor it is yet quite finished. I also bought at this time a number of sheep, which have since increased considerably: for, notwithstanding the great extent of this uncultivated land, where many of them might easily have been fed, none were ever kept upon it before. The people of the country thought they could not thrive there, on account of the marshes, and of a plant called white root, very prejudicial to them, found in several parts of the lay-grounds and commons. Most of these weeds was pulled up at a small expence; and the sheep, who are fond of this herb, eat up the rest, which was so little that it could not do them much hurt, though some of them were sick with it. The constant feeding of the sheep, and their dung, afterwards completed the destruction of this noxious plant, and brought up good grass in its stead. This shews how farmers may often get rid of any such bad weed.

"In 1739 I took the next contiguous land, going round my mansion: a method which I have always followed; so that my improvements have been, from year to year, more and more distant from my place of residence. The soil I now fell upon was tough, strong, and only thin grass grew upon it, with here and there a few brambles and other wild productions, which were soon cut up. This ground was broken up only with the plough: some dung was laid upon it, and I sowed it directly with winter oats

oats, which succeeded very well. My improvements of the two last years yielded plentiful crops, not only of corn, but also of hemp and flax. These last were dressed, and given to the wom n and girls to spin; paying them different prices, according to the fineness of the thread. They applied themselves to their work, and by degrees became perfect in it. By this means I accomplished my design of finding employment for these women and girls all the year round, and afforded them the means of procuring an honest livelihood, as well as to those whom age or infirmities rendered incapable of working abroad.

"The business ofthe field was always preferred in the seasons proper for it, and when the weather permitted; keeping in my eye Cato's advice, never to work within doors, while there is any thing to be done without, nor to do that in fair weather, which may be done in wet. I have continued this spinning ever since; and have allotted for the growth of hemp and flax particular spots, which I have inclosed with hedges and ditches, and kept in good heart and fine tilth. They have yielded plentiful annual crops without being rested; only dunging them every other year; for hemp does not impoverish the ground when it is properly cultivated. My vines, meadows, and ways were not neglected.

"In the beginning of this winter I gave my oxen hay mixed with an equal quantity of rye-straw, not having wheat-straw enough to answer that purpose. This succeeded to my wish. My oxen continued in perfect health, free from the vermin I mentioned before, and in better plight than those in the neighbourhood, which were fed with hay and wheat-straw. I have continued to give them this food as long as they lie within doors, and find it answer extremely well. During this time they have no corn, even though they work; and I do not find that this suppressing of their otherwise usual allowance of oats, renders them at all less hearty and vigorous. This quality of the rye-straw may be of great advantage in countries where oxen are used for ploughing.

"In the year 1740, I was obliged to make a considerable addition to my number of servants, and stock of cattle of all sorts, in proportion to the increased extent of my improvements. It may perhaps be thought, that so many servants would eat me out of house and home. This I had guarded against from the beginning. All those employed in my husbandry lived by themselves, in some of the out-houses, where they had their own kitchen, and a certain stated allowance, suited to their usual manner of life; so that they had no sort of connection with the others, whose more immediate business it was to attend me.

"The land which I improved this year was covered with heath, broom, and furze, which had grown very thick and high. In the spring, when the weather was dry, I set fire to this surface, after taking due precautions to hinder the flames from spreading too far. The whole burnt very well, and I was in hopes of being able to plough up this ground without paring off the turf, as I had done with my other land the year before. This would have been a considerable saving; especially as the ashes were ready spread. But I should have considered that different lands require different treatment. Ploughs, stronger than usual, were made on purpose for this work; but the roots of the furze and broom, which had resisted the fire, broke them; and though I doubled the number of my cattle for draught, several of the oxen were ruined by this hard work, in which I persisted with too much obstinacy. In vain did I plough it over and over, and break every clod both before and after sowing it; the broom and furze were not destroyed, but made new shoots every where: the land continued unkindly and sour, and the oats which I sowed in it yielded scarce any crop; in short, repeated ploughings and dunging were necessary during three years, before it could be brought to a good tilth, or those noxious plants be quite extirpated. I came badly off in this experiment: but my former improvements, which I had continued to manure and sow, luckily produced an abundant crop: that of the last year yielded a good quantity of wheat, which kept up my establishment, though it did not compensate for the loss I now sustained. However, this disappointment did not discourage me. It raised the laugh of the whole country at my expence; especially of those who had foretold from the beginning, that I should not succeed. I gave them the hearing, and only resolved not to fall a second time into the same error.

"This year I established a nursery of fruit-trees, and also of forest trees from other countries. This nursery, which succeeded very well, was of great advantage to me afterwards, to fill up the different plantations which I made as my improvements extended. I likewise repaired my woods, which had formerly been destroyed by cattle and deer. I surrounded them with ditches planted with hedges, in order to bring them into regular yearly cuttings; to which end I grubbed up such trees as were stinted in their growth, and filled every empty space, either with young plants, or the seeds of others, according to the nature of the ground. By continuing to do this every year, my woods are now in excellent order, and afford regular cuttings, at the small expence of keeping the fences in repair.

"In 1741, I had the same kind of land to deal with as the year before; but took care not to commit the same fault. Each day's cutting of the heath, broom, &c. was burnt, with proper precautions, as the workmen advanced, and the whole surface was dug by hand as it was cleared. By this means, the ashes of these plants preserved their fertilizing quality, and their roots were pulled up. Women and children shook the earth from off these roots, and turned them, whilst they were drying in the hot weather. These were also laid in heaps from space to space, and burnt upon the spot, where they yielded some ashes, which were spread, and immediately buried with one turn of the plough.

"During the summer, this ground was ploughed several times; each time in a direction different from the former. My cattle were but little fatigued with this work; the heath, broom, &c. was almost entirely destroyed, and the sourness of the land was in a great measure cured. I had then begun to make composts, which were mixed with the dung of the stall and stable, and proved of singular benefit. With their help, I was enabled to manure my newly broken up land sufficiently; that is to say, to lay upon it half the quantity that is generally used of dung for the common run of lands. I sowed this piece with rye, which yielded a plentiful crop. The crops from my former improvements, which I continued to sow without resting them, were likewise very good this year, excepting that of the last, which was also under rye, and yielded but a middling produce. My vineyards were now brought into as good order as any in the province; and I continued draining my meadows, and making roads and causeys.

"The war then calling me into Bohemia and Bavaria, I foresaw that I should be absent some time, and consequently not able to spend part of the year in the country, as I had used to do; to give directions to my people, and see my orders executed. Under these circumstances, that my improvements might not stop, I gave the direction of the whole to an intelligent servant, who had lived with me a long while, and was married to an excellent housewife: and, to interest him the more in the future success of the undertaking, I agreed to allow him half of the profits of every kind; subjecting him to this only restriction, that he should not impoverish the ground by too many crops. In this state things went on till the end of the year 1748.

"In the mean time new pieces of land were broken up every year; but not so extensive as the former; the expence of my campaigns not permitting me to lay out upon them so much money as before. I even streightened myself, not to interrupt the progress of my improvements: which, in general, succeeded very well. I also revived an old method of breaking up land, by cutting off the surface with a paring mattock, and then burning it. *See the article* BURN-BAKING.

"During the whole of this time, I was but two years together without visiting my estate, where my presence was then very necessary. In all the other years, I gladly accepted the leave which was given me to see how my works went on; though I sometimes did not stay above a fortnight among them. However, this was enough to give an eye to every thing that was doing; which is of great consequence in undertakings of this kind.

"Peace being restored, I resumed the personal guidance of my affairs in the beginning of the year 1749, and placed my old servant in a farm which I had to let, where his profits sat him down at his ease. Though he was extremely faithful, and my improvements were carried on very well, yet I found that, for want of due care and attention at certain times, the crops were not equal to what they had been under my immediate direction: a circumstance which plainly shews, that a work like this never thrives so well as in the hands of the owner himself.

"I now resolved to pursue my improvements as before the war, that is to say, to break up larger tracts of ground every year, than had been done of late. Most of my yet uncultivated lands were, and had been from time immemorial, thick covered with high broom, heath, fern, &c. and experience had taught me that these were not to be broken up with the plough alone.

"Of all the methods which I tried, none seemed to me, as I said before, so good as the paring-mattock and burning. I therefore fixed upon this, and, in consequence, sent for the workmen I had formerly employed in trials of this kind: but their number not sufficing for the extent of ground which I purposed to break up this year, I sent for others from a distance, and was weak enough to let these last persuade me to contract with them at a set price, for paring the whole surface. I agreed to give them even more than they ought to have had for doing the work ever so well; for I was not yet thoroughly acquainted with the nature of this business. They began it in March; and, to earn their money the more easily, or rather to rob me, only skimmed off the mere surface, without hardly touching the roots of the plants, which they should have cut up. When this work was done, as they called it, for the burning part did not belong to them, they immediately came to me, and asked for their money, which I simply gave them, not suspecting the cheat, but only thinking they had earned it very soon. When the turf of their cutting was dry, I ordered it to be laid in heaps, and burnt. The small quantity of ashes which it yielded, made me suspect the roguery: but when I found that the roots in the earth broke some of my ploughs, in cutting only a single furrow to cover the seed, and that there was no clearing it of clods, I was thoroughly convinced that I had been the dupe of these people, and that this paring would be of little service. The wheat sowed in this ground rose indeed pretty well, and looked tolerably during part of the winter; but not being able afterwards to strike through the crust formed by the remaining matted roots of the plants, most of it died, and the little that remained scarcely returned the seed: nor could this land be recovered till the next year, even by ploughing, breaking the clods, and dunging.

"The bad success of this experiment, upon which a great deal of money had been thrown away, tried my patience, but did not discourage me. My neighbours began anew to exclaim against my projects, as they called them; and numbers of those people who are determined at all events to oppose every novelty, be it right or wrong, were pleased to vent their sarcasms at my expence. I let them talk on. The roguery of the people who had last pared my ground did not hinder me from still thinking that this was the best way of breaking up new land, especially heaths; and the event has shewed that I was right. This check, which was the last I received, made me resolve to take my measures better for the future.

"The rest of my improvement yielded very good crops this year, during which I continued to mend my roads and meadows. These long winded works, for which only a certain space of time, and a certain sum of money, could be allotted every year, have been continued ever since, and indeed are not yet finished. I likewise bought this year several hives of bees; though I had some before. These useful creatures have multiplied exceedingly; especially in a little garden, where my chief apiary is, situated between meadows and heaths, of the flowers of which they are remarkably fond. Though these industrious insects thrive perfectly all over the country I am speaking of, yet the inhabitants of these parts not only have not a tenth of the number they might keep, but ignorantly follow the old barbarous custom of destroying the bees, when they want their honey, instead of only taking part. *See the article* BEE.

"I did not agree by the piece for breaking up the land I intended to improve in the year 1750, lest I should should be again deceived; but hired proper labourers by the day. They began their work in March, and finished it about the middle of June; cutting all the way deep enough to go under the crust, or net-work, formed by the roots beneath the surface; for I took particular care to see that this was done. When the turf thus pared, to the thickness of about four inches, was dried, piled up, and burnt in heaps from space to space upon this ground, it yielded a considerable quantity of ashes, which enriched the soil for a long time. Wheat was then sowed, and the plough easily turned up the furrow which covered the seed. Women and children easily broke the clods of this ground, which was thereby at once brought into good order; the roots of all the wild plants having been effectually cut through, and their seeds destroyed by the fire. My wheat, by this means un-incumbered with noxious productions of any kind, flourished well, and yielded an excellent crop; as also did such other parts of my land as were under corn. The success of this year revived my hopes. I now perfected my method of making artificial dung, which, as I have already observed, proved of infinite service; and, for manuring my more distant lands, I built upon them perpetual kilns, which have always supplied me with a sufficient quantity of ashes.

"This year I began to plant white mulberries, in order to feed silk-worms, and make the inhabitants acquainted with the management of them. I have since continued to make plantations of this kind every year, and find them answer perfectly well, especially in light soils. Several of them are an useful embellishment to proper parts of my improved lands, and I have alleys of them, which, though not suffered to run up high, form a very pleasing prospect.

"In 1751, I again succeeded perfectly well in my new method of paring and burning. All my cultivated lands now yielded very good crops; and that in particular which I had broke up last year, and since dunged properly, that is to say with half the quantity commonly used upon ground in general, produced more than any other equal space had yet done. From this time I continued to dung all my grounds which were broken up in this manner, every alternate year.

"My improvements were now become so extensive, that I was again obliged to increase the number of my servants, and of my ploughing cattle. The same thing happened more than once after this; but I shall not mention it any more. My cattle too, of different kinds, had multiplied so much, that I had no longer room for them in the old farm-yard, or buildings belonging to it; but plainly saw, that if my improvements were enlarged every year in the manner they had hitherto been, I should soon want more yards, and more buildings, to keep them in. I accordingly marked out proper places for this purpose, and drew plans for more spacious buildings.

"As the cattle in this country are small, I bought some of a larger size in Poictou (from whence we generally have our working beasts), and particularly a fine bull, to try if I could mend our breed, and thereby have of my own oxen strong enough for the plough; by which means I should save the expence of buying them elsewhere. I have not yet succeeded in this, so far as I could wish; probably because my pasture is not yet good enough. However, my bullocks, proceeding from this race, are much stronger and bigger than those I had before, though not large enough to be yoked to the beam, but only before or with others.

"The ground which I broke up in 1752, was pared and burnt in the same manner as that of last year, and produced an equally good crop. My other corn lands did the same; and I have since continued, and still continue, at the time of my writing this, to break up a parcel of heath, or other waste-ground, every year. The success has answered; so that my improved lands now yield me every kind of corn which this country produces. Turky-wheat, buck-wheat, and millet, have done extremely well in some parts of them; and so have flax, hemp, and other productions suited to the different qualities of the soil. In some places I have sowed, at different times, several sorts of trees, such as the oak, the beech, the chesnut, the fir, and others, all of which thrive wonderfully. I have likewise planted new vineyards, and find them answer perfectly well. All these trials convince me more and more, that the very best way of preparing land, is by burning it, as I have already said more than once. Those who were formerly the readiest to blame my undertakings, now see their error, and commend them.

" During this same year 1752, as well as in the course of the following, I drained several marshes, and improved other pieces of uncultivated ground, which, not being of the heath kind, or proper for paring, were broken up, and fitted for their respective crops, whether of corn, or of other plants, as will be more fully related in the second part of this account. I likewise sowed in these, as I had done before in other places, trees of every kind, some of which have succeeded, and others failed, according to the soil, and the manner of preparing it. This also will be more fully noticed hereafter, when I shall speak particularly of the different methods of raising trees from their seeds; and of the means of obviating the three chief difficulties, which must of necessity be guarded against or removed, before one can properly set about breaking up any sort of ground; these are, water, stones, and large roots; each of which I have found it necessary to get rid of, before I could rightly begin any of my improvements.

" I endeavoured this year to make some progress towards perfecting my instruments of husbandry; my new buildings went on according to the plan I had laid down, and were extended from time to time, in proportion as the products of my enlarged improvements, and the increase of my stock of cattle, required more room. I likewise tried to mend the breed of horses in this country, where their chief fault is, that they are too small.

" My sheep were also of too small a size, and yielded but little wool; which indeed is the case throughout all this province. I therefore got from Lower Poictou, in the year 1753, two fine rams, of the large kind, called Flemish; by which means my lambs are much stronger than any other in these parts. Several of the males are almost as large as their sires, and I have given some of them to my neighbours for rams. They have produced a bastard breed, which increases apace, and, though not so large as the Flemish, yields more and better wool than our former breed. I got rid of all my old sheep by degrees, and have now a well-sized flock: nor do I doubt but that if I could conveniently have purchased a whole flock of these large sheep, their breed might have been preserved without degenerating, and increased so as to supply the place of our present inferior species; for our uncultivated lands would feed a much greater number of sheep than we even attempt to raise.

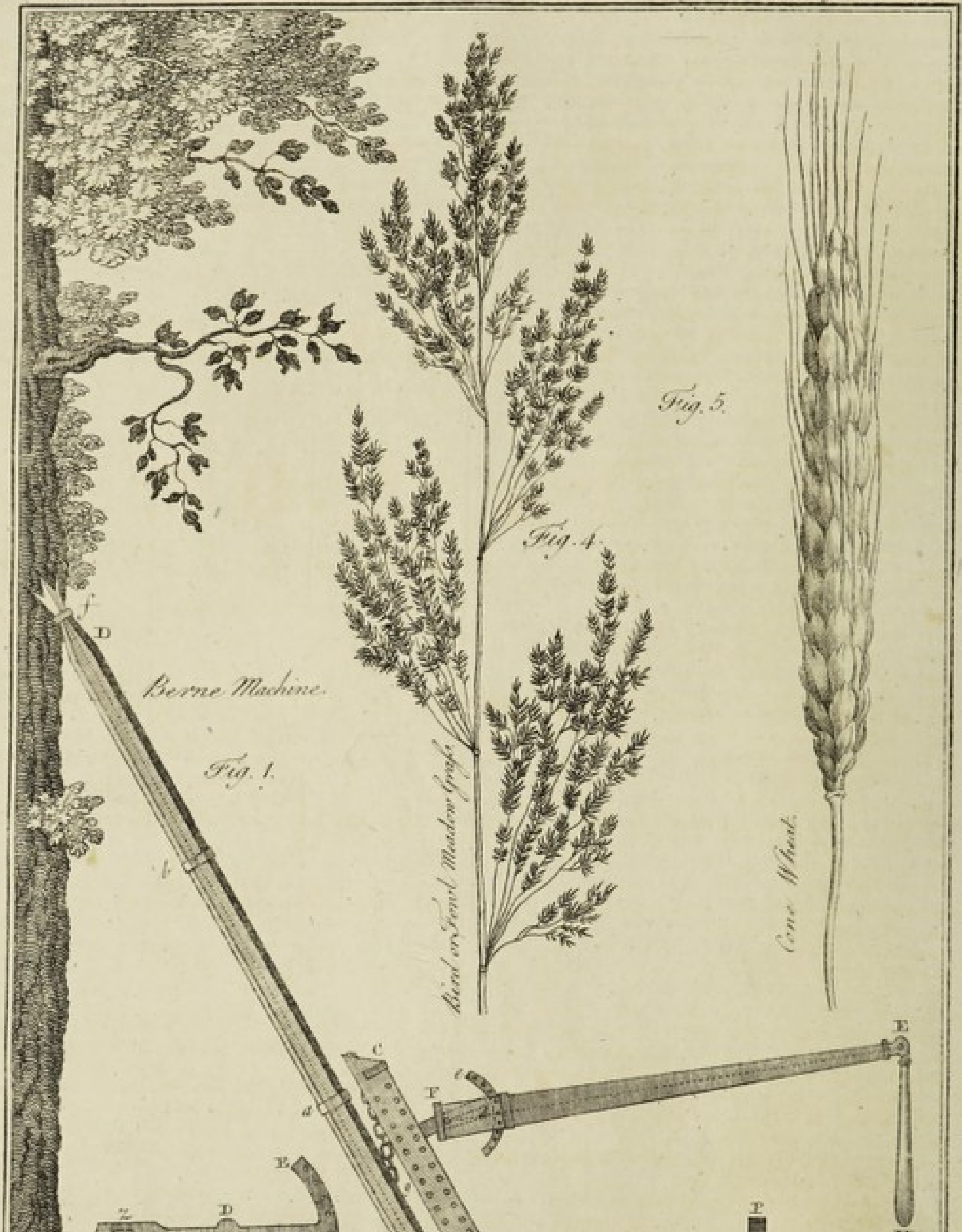
" In 1755, I discovered lime-stone upon my own land. This proved a considerable saving; for I had hitherto been obliged to fetch my lime from a distance of near twelve miles. This stone, if properly searched for, may often be found in places where it it not suspected to lie. It is easily known, by putting a piece of it into the fire till it be calcined, and then dissolving it in water. This discovery, in consequence of which I built a proper kiln, has enabled me to carry on my buildings with less expence than before, and is of signal service in affording an excellent manure for my land.

" I began this year to give premiums for agriculture to the inhabitants of my estate. They were instituted the year before; and I had long used my best endeavours to inculcate a general love of industry, and a relish for improvements. My success had induced several others, both landlords and farmers, to follow my example, as well in amending their already cultivated lands, as in the breaking up of new grounds. I assisted them in their undertakings, giving instructions to some, lending seeds to others, and money and tools to such as were honest, and wanted them. The better to encourage them all, I had given rewards every year to those who distinguished themselves most, and allowed my tenants sixteen shillings for every acre of new ground broken up by them: a regulation which still subsists.

" To fix these people in the industrious disposition to which I at length had brought them, no method seemed to me more proper than to take them on the weak side of almost all mankind, interest and vanity. Accordingly, I notified in the month of January 1754, that I would distribute every year, beginning on the next ensuing festival of the Assumption, two premiums for agriculture; one, to the person who should raise the finest crop of wheat, and the other to him who should have the best field of rye. Each of these premiums consists in a sum of money, not inconsiderable for the country where it is given, and a silver medal, engraved for the purpose, of the size and value of a crown piece. These were, I believe, the first premiums ever proposed in France for this most useful object; though many have been given for much less interesting concerns. On one side of this medal is a sheaf of corn, with two sickles, a scythe, and a flail; over which are the words, *Premium for Agriculture*, and underneath the date. On the other side are my arms, with this inscription round them: *To excite to Industry the Inhabitants of*, &c. I would not put the goddess Ceres of the ancients, or any emblematical figure upon this medal, because, in the first place, the ignorant peasants would not have understood its meaning, and in the next, some of them might perhaps, hereafter, take it for the representation of a saint, and honour it as such; by which means, what I intend only for an object of utility, would become a source of superstition or idolatry.

" A candidate for these premiums must have at least two acres of land sowed with either wheat or rye: they are given to the finest crop as it stands, to avoid all tricks; and if two crops are deemed equally good, the worst soil has the preference. When both the crops and the soils are alike, the largest extent of ground is entitled to the reward. The inhabitants of the place, in general, meet at the parish church on the day appointed; and, after divine service, choose from among themselves five who are not candidates, to inspect all the fields of corn, and mark those which they think the finest. On the next Sunday or holiday, they make their report to the same assembly. If any one complains that his corn has been unjustly passed over un-noticed, proper persons are immediately sent, to examine whether the complaint be just. The assembly then appoint the same five as before, or others if they please, to go and inspect again, with the utmost care, the fields which they had marked, and to judge which two of them, one of wheat, and the other of rye, best deserve the premiums. On the next Sunday or holiday they declare their opinions to a general assembly of the parishioners, as before; and, if no objection be made by any of those whose corn has been marked, this assembly adjudges the premiums accordingly: but if any one of them appeals, other proper judges are immediately chosen, and directed to inspect the spot. On the next Sunday or holiday, till which the decision of the premiums is, in this case, of course put off; these last examiners make their report, and the matter is then determined. All the people thus sent by the assembly, are paid at my expence. In consequence of the decision of the inhabitants, the premiums are delivered publickly on the feast of the Assumption, after the service at church is over. Those who win them, wear the medal, for a year only, fastened with a green ribbon to a button-hole of their coat, and have, likewise for that time, a distinguished seat in the parish church. These marks of distinction cease at the end of the year, when others succeed to them; but the medal remains the property of the person to whom it was adjudged. He may dispose of it as he pleases: yet, though he is no longer allowed to wear it on the outside of his cloaths, there has not been a single instance of any one's selling his medal. They all keep it as a badge of honour.

" These


Berne Machine
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Bird or Fowl Meadow Grass
Cone Wheat.
Scale of Five Feet
1
2
3
4
5

"These rewards have been productive of fo much good, and have raifed fo extraordinary an emulation among my tenants, that I cannot but advife every gentleman to practife the fame method upon his eftate. I intend to inftitute fome others, for different productions; and as I am far from having a fufficient number of people to manage all my lands, if the whole of them was under culture, I have long thought of giving gratuities to fuch as fhall have a child within the firft year of their marriage, to continue this allowance to them fo long as they fhall have a child from year to year, and to allot a pretty confiderable fum for the family which fhall have moft children. Some may, perhaps, think thefe encouragements for propagating the human fpecies odd, and even fuperfluous: but they will be of a different opinion when informed, as they may be by the minifters of moft country parifhes, that many peafants are unwilling to get children, or at leaft do not choofe to have more than a very fmall number, when they might have a numerous offspring. If my abilities were equal to my will, I fhould already have formed all thefe ufeful eftablifhments. It is generally allowed, and experience has particularly demonftrated it upon my eftate, that an increafe of culture produces an increafe of inhabitants; and that wherever there is room for two, with the means of fubfifting them, a marriage will enfue: but at the fame time that this means of increafing population is encouraged by a more extenfive culture of the earth, I fee no reafon why proper methods fhould not be ufed to induce men likewife to concur in the fame laudable end.

"Ever fince the year 1756, I have continued all my undertakings, and with the fame fuccefs as before. Thofe who faw the condition of my eftate when I firft came to it, in the year 1737, now fcarcely know again a fingle fpot of it; fo much is the face of the country changed. My manfion-houfe, which was formerly furrounded with dreary waftes, vaft commons, and unbounded heaths, now ftands in the middle of well cultivated fields; my improvements are become confiderable both for extent and value; producing all forts of grain, and natural as well as artificial graffes. I have difperfed in them all kinds of fruit-trees, and divided them into fields of proper fizes, feparated by good ditches planted with quick hedges. Alleys of limes, poplars, white mulberries, chefnuts, and various other trees, befides being a confiderable embellifhment to the whole, afford convenient paffes from one field to another, yield food to cattle, and are fown from time to time. I turn every thing to profit; even my drieft foils. Many of my marfhes are drained, and yield good crops. All my meadows, by reafon of their great extent are not yet brought to the ftate in which I wifh to fee them; though a great part of them now produces excellent hay. I have mowed fome of them twice a year, and hope by and by to do the fame to others; for I intend to water them all, by making dams and fluices in the brooks and rivulet which pafs through them.

"My vineyards are in good order; and my woods, which are now in regular cuttings, thrive perfectly. Some of thefe, which I have raifed from the feed, have grown fo prodigioufly, that a ftranger would think them much older than they really are. I have made fome large refervoirs of water, and feveral ponds, intirely new, befides repairing the old ones. All thefe have fucceeded, and yield good fifh. A quarry of mill-ftones, formerly abandoned, now turns to good account, and I have difcovered feveral quarries of free-ftone.

"I have been obliged to make feveral bridges over the brooks and rivulet which divide my meadows and marfhy grounds, and have carried my roads as far as my improvements extend. Some of thefe roads lie over hills, which could not be avoided; though others have been cut through, at a great expence. Moft of my out-houfes, which are pretty fpacious for all my cattle and all the produce of my land, with proper buildings for poultry, barns, granaries, &c. are finifhed; and I have built farm-houfes with the ftones which it was neceffary to take off the lands, in different parts of my improvements, and fettled in them young men, who are now married, and have children. Though my barns are very large, and not few in number, I have the pleafure to find that they would not contain all my laft year's crop of corn: a fatisfaction which I hope to enjoy ftill more amply in the next and following years.

"Thus my eftate, which formerly yielded fcarce any thing, now affords every neceffary for food and raiment. When there, I can, truly fpeaking, keep a very good table, and be decently cloathed, with only the produce of my own improvements. I have no occafion to buy any thing, except falt, fugar, and fpices. My farmers have followed my example, fo far as their means, and the helps which I have given them, have permitted.

"Thefe improvements have, undoubtedly, coft me a great deal of money; but my income from them will foon be proportionably increafed: befides which, it is proper to obferve, that few lands will require fo great an expence to break them up, as mine have done; owing to the uncommon ftubbornnefs, inequality, and unkindlinefs of the foil: nor will it often be neceffary to cut through hills in order to make roads, to lay caufeys over quaking bogs, or to erect fo many new buildings: though, even if all thefe difficulties fhould occur, I would ftill advife gentlemen to undertake the improvement. If they follow the directions here given, and profit by my errors, fo as not to commit the like, I can affure them of fuccefs, at a much lefs expence than it has coft me, who have thoroughly paid for my apprenticefhip. I can alfo promife, that they will lay their money out at better intereft, and on better fecurity, in this, than in any other way: befides which, they will have the heart-felt fatisfaction of contributing to the profperity of their country, to the increafe of population, and to the enriching of others, at the fame time that they enrich themfelves.

"I have already faid, that when I began my improvements, two and twenty years ago, a third part of the farms in my parifh were untenanted, for want of farmers who would rent them; that moft of the inhabitants of my eftate were very poor, and did not, in general, reap corn enough to fupport them half the year; that they were grown fo indolent, that rather than cultivate their ground, which would have afforded them a maintenance, they chofe to beg, like vagrants, in the neighbouring diftricts. Now, their fituation is very different, and they are no longer in that deplorable condition. They are become induftrious, live by their labour, and beg no longer: they would even be at their eafe (a happinefs which I fhall do my utmoft to procure them), were it not for obftacles beyond my power to remedy. The parifh now reaps more corn than it confumes; fo that the farmer here is enabled to fell at the very markets where he ufed to buy. All my farms are tenanted; not a houfe on my eftate is empty, and if I build a new one, it is immediately filled; in fhort, the number of inhabitants in this parifh, for I have an exact lift of all of them, is double what it was in 1737. Such is the hiftory of my improvements, and fuch are the effects with which they have been attended." *Memoire fur les Defrichemens, par.* II.

COMPOST, an ufeful fort of manure, confifting of earth, dung, lime, clay, &c. according to the nature of the foil, well mixed and rotted together, till it forms one united mafs. *See* DUNG-HILLS.

CONE-WHEAT, a fpecies of wheat, called in fome parts of Somerfetfhire, blue-ball. Some of the ears of this wheat have awns, and others none. *See* Plate IV. Fig. 5.

CONIFEROUS, an epithet applied to fuch trees as bear acones, as the fir, pine, cedar, &c.

CONSERVATORY, a place where fruits, &c. are preferved. It is fometimes ufed to fignify a green-houfe. *See the article* GREEN-HOUSE.

CONSOUND, the fame with bugle. *See the article* BUGLE.

CONSUMPTION, a difeafe incident to horfes, confifting in a wafte of mufcular flefh, attended with a flow fever.

When a confumption proceeds from a defect in a horfe's lungs, or any principal bowel, the eyes look dull; the ears and feet are moftly hot; he coughs fharply by fits; fneezes much, and frequently groans with it; his flanks have a quick motion; he gleets often at the nofe, and fometimes throws out a yellowifh curdled matter,

matter, and he has little appetite to hay, but will eat corn, after which he generally grows hot.

As to the cure, one of the principal things is bleeding in ſmall quantities, a pint, or pint and half, for ſome horſes is ſufficient, which ſhould be repeated as often as the breath is more than ordinarily oppreſſed. Pectorals may be given to palliate preſent emergent ſymptoms; but as diſſections have diſcovered both the glands of the lungs, and meſentery to be ſwelled, and often indurated, the whole ſtreſs lies on mercurial purges, and the following ponderous alteratives, given intermediately.

Take native cinnabar, or cinnabar of antimony, one pound, powdered very fine, and add the ſame quantity of gum-guaiacum and nitre: give the horſe an ounce of this powder, twice a day, wetting his feeds.

The ſpring graſs is often extremely ſerviceable, but the ſalt-marſhes are to be preferred, and even to be more depended on than medicines; for great alterations are thereby made in the blood and juices, and no ſmall benefit ariſes from open air, and proper exerciſe.

But it may be worth obſerving, that a horſe frequently relapſes after appearances of amendment; when a yellowiſh gleet, or curdled matter, runs from his noſe, and he grows emaciated, is much addicted to ſweat, heaves much with a reduplicated motion, and has a ſhort rattling cough; under theſe circumſtances there can be little hopes of his recovery, or any future ſervice from him, conſequently, to ſave further expences, the beſt way would be to diſpatch him as an incurable. *Bartlet's Farriery, p.* 76.

CONVOLVULUS, the ſame with bind-weed. *See the article* BIND-WEED.

COOM, the ſoot that gathers over the mouth of an oven; alſo a compoſition of tar and greaſe, with which the axle-trees and boxes of the wheels of carriages are daubed or ſmeared over, in order to leſſen the friction.

COOP, a tumbrel, or cart encloſed with boards, to carry dung, ſand, grains, &c. which would otherwiſe fall out.

COOP, likewiſe ſignifies a pen, or encloſed place, where lambs, poultry, &c. are ſhut up, in order to be fed.

COPPICE, low woods, cut at ſtated times for poles, fuel, &c.

" If you are to plant a coppice, ſays the ingenious Mr. Liſle, it is a good way to ſet your plants in trenches, as one raiſes quickſet hedges, and not to ſow ſeeds, for they are tedious in coming forward, and will tire one's patience in weeding them. I would not ſet above four plants in twelve feet ſquare, and at regular diſtances, ſo that the benefit of ploughing might not be loſt; and then at ſix or ſeven year's growth I would plaſh, by laying the whole ſhoot, end and all, under the earth in the trenches, which would not therefore be choaked, but ſhoot forth innumerable iſſues: this, by great experience, oak, aſh, hazle, and withy, will do.

" In our parks we never ſet leſs than an hundred plants in a double chafed lugg; and, if the earth turned up ſuch rubbiſh and ſtony ſtuff that the edge of earth on which they are to plant, is too narrow for a double chaſe, then they always ſet eighty plants on a ſingle chaſe in a lugg.

" I obſerve the ſedgy graſs comes not up in felled coppices the firſt ſummer; conſequently the young ſhoots have a year's ſtart of that graſs; the next ſummer the ſedgy graſs comes up, and grows ancle high, equal with the two year's ſhoots: but what harm can it then do to the wood? The third year the ſedgy graſs dies, and you ſee no more of it. I ſpeak this, in anſwer to the countryman's objection, who pleads for putting ſome ſort of cattle into coppices to keep down the ſedge, which he pretends otherwiſe will choak and damage the plants. I have experienced this to my coſt.

" It was May the ſixth, in the year 1701, that I bought ſome yearlings; and I aſked the farmer, if I might not put them in the coppice till midſummer; the farmer ſaid, not yet, by any means, for fear they ſhould be oakered, that is, leſt they ſhould bite off the oak-bud before it came into leaf, which might bake in their maws and kill them; but after the oak-bud was in leaf, it would be ſafe enough. The higher coppices are fit for yearlings, and the coppices of the laſt year's growth for hog-ſheep in winter. My ſhepherd ſaid, what the farmer obſerved as to the oak-bud was true; but he thought that the year was ſo backward, that they were not yet come out, and ſo there could be no danger at preſent. Farmer Elton ſaid, his father had loſt abundance of yearlings by the oak-bud, by putting them into the coppices while that was out. I have ſince experienced the ſame, and I have remarked the ſame.

" It is a common ſaying, that calves will not crop in woods: but I put ſix calves into my woods, in November, which very much cropt the yearling-ſhoots. All huſbandmen I told of it very much wondered at it; but the reaſon to me was clear, viz. On firſt putting them in there came three or four days hard froſt, with a ſhallow ſnow, and a rime that laid on the bennetty graſs, ſo that they could not come at the ground, but only met with brier leaves, of which, though I had plenty, they were but thin diet to depend on altogether; yet together with other pickings would have been a noble maintenance for them, if they could have come at the rowet: this ſtreightneſs of fodder brought them to the neceſſity of cropping the young ſhoots, which they afterwards continued to do, having got the habit of it, and finding, when the weather came ſevere, the ſhoots to be toothſome, though the rowet in the coppices would have been ſufficient.

" For a general rule, newly weaned calves are leſs hurtful to newly cut ſpring-woods than any other cattle, eſpecially if there be abundance of graſs; and ſome ſay, colts of a year old will do no harm: but the calves muſt be permitted to ſtay a while longer, and ſurely the later you admit beaſts to graze the better.

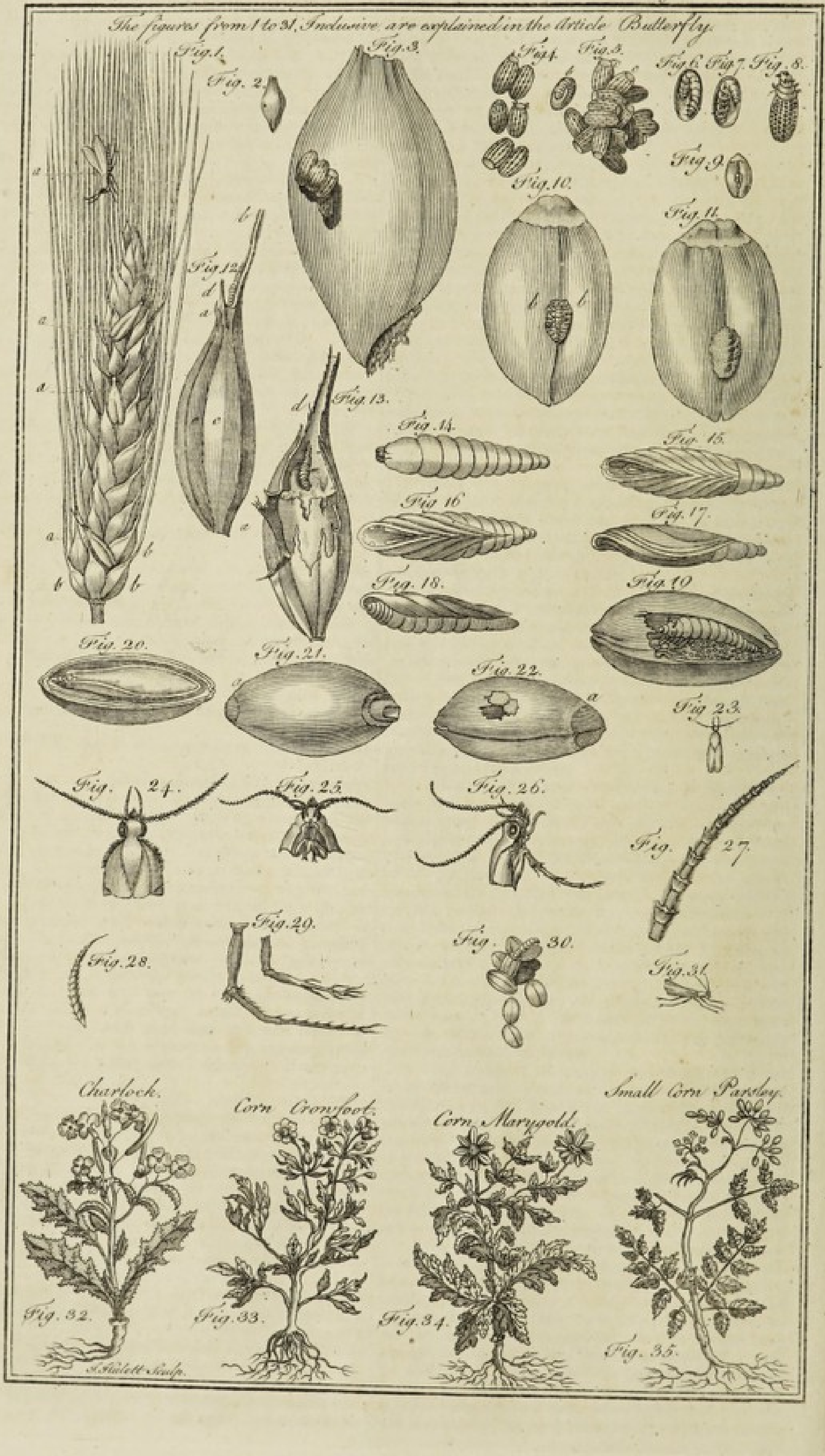
" Letting coppice-wood grow to ſixteen or ſeventeen years growth is of great ſervice to young heirs, becauſe by ſo many years growth their backs are caſe-hardened, and able to withſtand the cold, when the coppice is cut, and they muſt ſtand naked, whereas, when coppices are cut at ten and eleven years growth, the barks of the young heirs are ſo tender, that they are ſtarved with cold air and winds. Ivy itſelf, ſays Evelyn, the deſtruction of many a fair tree, if very old, and taken off, does frequently kill the trees by a too ſudden expoſure to the unaccuſtomed cold.

" When coppice-wood is of fourteen or fifteen years growth, it will yield a better price in proportion than young wood, becauſe it will be applicable to more uſes, and particularly in the cooper's buſineſs; for he will uſe the withy and ſome of the aſh for hoops and wine hogſheads; another part of the aſh may ſerve for prong-ſtaves, rake-ſtaves, and rath-pins for waggons, and the reſt may be parcelled out for hurdle and flake-rods.

" Oaken ſtems of fourteen years growth are, in my woods, which in a great meaſure conſiſt of them, as high as the aſh or withy, and meaſure more in the diameter; for oaken ſtems are ſtronger at root, and will hold growing longer than aſh, withy, or hazle. When hazle grows ſpriggy in the body, and ſhoots forth from the ſides of the back, it is a ſign that it has given out, and done growing at the top.

" Coppice-wood, in hedging and hurdling, wears much better and longer, if cut between Michaelmas and Chriſtmas, but ſells beſt in faggots, if cut between Chriſtmas and Lady-day, becauſe it ſhrinks leſs, and is much ſwelled, and looks beſt to the buyer. The method at Crux-Eaſton, and the hill-country adjacent, is only to oblige the buyers to rid the coppice by Midſummer; they think the coppices are not harmed, if rid by the time the Midſummer-ſhoots ſpring up; but they had not rid this year, 1697, by the latter end of July.

" It is obſerved, that coppice-wood, cut for hedging at the latter end of winter, will not endure ſo long by a year as that which is cut at the beginning of winter: which, as I believe, may not only be, becauſe the wood late cut, is cut after the ſap is riſen, or attenuated by the ſun, but alſo oftentimes becauſe it is not cut long enough before ſuch rarefaction is made; for, if a tree, or a cyon cut to be grafted, as Quintery affirms, will endure many weeks of the winter out of the ground, or without being grafted, and, when ſpring ſhall come, it will by virtue of the ſap inherent in it, when attenuated, put


The figures from 1 to 31, Inclusive are explained in the Article Butterfly.
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Fig. 13.
Fig. 14.
Fig. 15.
Fig. 16.
Fig. 17.
Fig. 18.
Fig. 19.
Fig. 20.
Fig. 21.
Fig. 22.
Fig. 23.
Fig. 24.
Fig. 25.
Fig. 26.
Fig. 27.
Fig. 28.
Fig. 29.
Fig. 30.
Fig. 31.
Charlock.
Corn Crowfoot.
Corn Marygold.
Small Corn Parsley.
Fig. 32.
Fig. 33.
Fig. 34.
Fig. 35.
J. Hallett Sculp.

put forth buds for some time, till it dries away; so it follows, that the sap inherent always in the stem of the wood, if not cut so early as to have long time to dry, may be put into motion at spring, so as to effect the abovementioned inconvenience; therefore I hold hedging-wood and fire-faggots should be cut in October.

"It is a common practice of husbandmen to fell their hedge-rows, and small brakes within the grounds, those years they sow the grounds with wheat; but such persons ought well to consider, first, whether such land, after the wheat is off, will not bear a rowet too long for sheep to eat, and, if so, great cattle must be put in to eat up the long rowet, and the sooner the better for their tooth; and then attendance must be given by a cow-keeper by day, before the harvest is in, and consequently the wages dearer, and when you may have many other offices to employ such a person in: therefore, in such case, my advice is to let the hedge rows stand till after the wheat crop be got in, when great cattle may be suffered to feed down the rowet without prejudice to the hedge-rows, and at that time of the year such grass is wanted by night; and, during the future three crops, it is to be supposed the rowet will not be so large, but sheep may overcome it, nor will they very much prejudice the young wood." *Lisle's Husbandry, vol.* II. *p.* 245.

In raising coppices, great care ought to be taken that the wood they are to be composed of be such as is proper for the soil you raise them on, and that it be proper for the uses you design to sell it for, which you must be regulated in by the vent you have; and let the profits resulting from your under-wood regulate the thickness of your standards; for in proportion as they are thicker or thinner, they will do more or less injury to your under-wood. You should likewise consider at what growth you can sell your under-wood; only remember that the older and taller your under-wood is, the better it is both for fuel, and for what standards you leave, because they will be the taller and straiter, by being forced up by the wood that grows about them; though a deep soil contributes much to their spring. It is also necessary, about the time of your felling, to lay out your severals falls, that you may have an annual succession, to yield a yearly profit. But though the seldom felling of coppices yields the more and better wood; yet the frequent cutting of it makes it thicken, and gives room for the seedlings to come up. If many trees grow in the coppice that is to be cut down, fell both them and the underwood together, cutting off the stubs as near the ground as convenient, and those of the underwood a-slope and smooth, and not above half a foot from the ground; and stock up the roots of the timber-trees, if they send forth no shoots, in order to make room for seedlings and young roots to grow.

The under-wood may be cut from the beginning of October to the latter end of February; but February is the best month to cut wood in, where you have but a small quantity to fell, that you may do it before the spring comes on too much: take great care to prevent the carters from brushing against the young standards, and let all your wood be carried out by Midsummer, and made up by the end of April at the farthest; for if the rows and brush lie longer unbound or unmade up, it will spoil many of the young shoots and seedlings. If the winter before you fell, you enclose it so as to keep all cattle out of it, your care and trouble will be well recompensed.

Your elder underwood may be grazed about July, or in winter, but, for a general rule, newly weaned calves are the least prejudicial to new cut wood, where there is abundance of grass; and some fay colts of a year old; but then they must be drove out by the beginning of May at farthest. However, if nothing at all be suffered to come in, it will be better. In this every man's experience must direct him.

If your woods happen to be cropt by cattle, it will be better to cut them down, and they will then make fresh shoots; whereas what has been bit by the cattle, will be otherwise stunted for several years before it will take to its growth. *Mortimer's Husbandry, vol.* II. *pag.* 69.

CORD *of Wood*, a certain quantity of wood for fuel, properly stacked up; so called because it was formerly measured with a cord. The dimensions of a statute cord of wood are eight feet long, four feet high, and four feet broad.

CORE, a disorder incident to sheep, occasioned by worms in their liver, resembling a plaice, or flounder.

A sheep, if chiefly fed with hay, will live a year after being affected with this distemper, by which time he will have a water-bladder as large as an egg, under his throat; at the same time his eyes, mouth, and gums, will be white.

If any sheep in a flock core during the winter, it will be easily seen at shearing-time; for such sheep will be poorer than the rest; their wool also will run into threads, twisting together at the ends, and look somewhat like teats. The last particular is not however a certain sign of a sheep's being cored; for sometimes the wool of very sound sheep will be apt to run together into threads; and the finer the wool the more apt it is to twist together in that manner. There is no method of curing this distemper hitherto known. *Lisle's Husbandry, vol.* II. *pag.* 207.

CORIANDER, the name of a plant formerly much cultivated in England; but at present little of it is sown.

The seeds should be sown in autumn on rich land; and when the plants are come up, they should be hoed out to about four inches distance, every way, clearing them from weeds. By the above management, the plants will grow strong, and produce a greater quantity of good seeds. *Miller's Gard. Dict.*

CORN, a general name for grain that grows in ears, not in pods, as wheat, barley, &c.

If corn be lodged, it may be cut before it is quite ripe; and if blighted, it cannot be cut too soon. But if neither of these accidents happen, both wheat and barley should be suffered to stand till full ripe. The grain will also grow plumper by being left a while in the field after cutting, to take the dew; but the straw will be injured by it; nor must it by any means be laid up damp in the mow, lest it heat, and become what is called mow-burnt; and perhaps take fire. A great number of weeds will produce the same effect, if the corn be housed before their stalks are sufficiently withered.

A correspondent of the authors of the Museum Rusticum tells us, that in the year 1763, he had twenty acres of barley, which was rather weedy at harvest: on which account he was desirous of giving it as much field room as he could conveniently; but the weather promising to be very wet, he was obliged to cart his barley, which he put into the bay of a large barn.

Whilst this work was going forward, he was called away, and in his absence his son got a horse upon the mow to tread it; by which means, the weeds, not being thoroughly dry, caused the barley to heat to so violent a degree, that he was very apprehensive of its firing.

"My men, adds he, were in a violent hurry to get it out of the barn; but this I would by no means consent to. I however ordered one of them to get upon the mow with a cutting-knife, and cut in it a round hole like a well. He began the work; but in about five minutes, being almost overcome by the heat, I sent another to relieve him; and thus they worked spell and spell, till they got to the bottom.

"This round hole saved my barley, and perhaps my barn too; for it formed, as it were, a chimney or flue, to carry off the heat." *Museum Rusticum, vol.* III. *p.* 365.

For the method of preserving corn after it is threshed, *see the article* GRANARY. And for preserving it in the straw, *see* REEK.

CORN-CROWFOOT, a weed very common among the corn. It has an upright stalk; the leaves are of a pale green, and cut into long, narrow, acute segments. The flowers are much smaller and paler than the crowfoot of the pastures: but the seed-vessels are the most remarkable, being covered all over with prickles. *See* Plate V. fig. 33.

CORN-FLAG, a very troublesome weed, multiplying exceedingly by its roots. It has a round compressed tuberous root, which is of a yellowish colour, and covered with a brown furrowed skin, like that of the vernal crocus. From this root arises two flat sword-shaped leaves, which embrace each other at their baſe; and between theſe ariſes the flower-ſtalk, which grows near two feet high, having one or two narrow leaves embracing it like a ſheath. This ſtalk is terminated by five or ſix purple flowers, ſtanding above each other at ſome diſtance, and ranged on one ſide of the ſtalk; each of theſe has a ſheath, which covers the flower-bud, before it expands, but ſplits open lengthways when the flowers blow, and afterwards ſhrivels up to a dry ſkin, which remains about the ſeed-veſſel, till the ſeeds are ripe, which is in the beginning of Auguſt. The flowers come out in the beginning of May, or in June. Some of theſe flowers are white, and others fleſh-coloured.

Corn-flag is extremely difficult to root out, as every part of the root will grow. The beſt manner of extirpating it is that already mentioned under the article coltsfoot. See COLTSFOOT.

CORN-MARYGOLD, the name of a very troubleſome weed, of which there are two ſpecies, one common in corn-fields, and the other in moiſt paſtures. The leaves of the firſt ſort embrace the ſtalks, the upper being jagged, and the lower indented like a ſaw. The ſecond is, by C. Bauhine, called the greater wild daiſy, with a leafy ſtalk. It riſes with ſtalks near two feet high, garniſhed with oblong indented leaves, which embrace the ſtalks with their baſe. Each of theſe ſtalks is terminated by one white flower, ſhaped like that of the daiſy, but four times as large. It flowers in June. *See* Plate V. fig. 34.

The corn-marygold has a perennial woody root, which ſtriking deep requires a conſiderable quantity of food, and therefore muſt be a great enemy to the corn. Conſiderable pains muſt be taken before this weed can be extirpated, as it is highly probable, that, beſides multiplying by its roots, its ſeed will grow, if ploughed in, as that of the garden marygold will do when dug in. Deep and repeated hoeings are therefore neceſſary, before it runs to ſeed.

CORN-PARSLEY, the name of a low branching plant common among corn. The branches grow thick together, and are knotted and crooked. The flowers grow cloſe together after the manner of parſley, and are of a white colour inclining to yellow. The ſeeds are large in proportion to the plant; and are ſet about with little crooked briſtles; which makes them adhere to the ſtockings in great plenty, when the ſeeds are ripe; which is generally about harveſt. *See* Plate V. fig. 35.

CORN-WORM, the inſect lately obſerved in France to be ſo very deſtructive to corn. *See the article* BUTTERFLY.

CORNER-TEETH, the teeth which appear when a horſe is coming five years old. *See the article* AGE.

CORONET, the loweſt part of a horſe's paſtern, which runs round the coffin, and is diſtinguiſhed by the hair which joins and covers the upper part of the hoof.

COSH, the ſame with pods. *See the article* POD.

COSSART, or *Coſſet Lamb*, a lamb left by its dam's dying before it is capable of ſhifting for itſelf; or it is a lamb taken from a ewe that brings two, three, or four lambs at a yeaning, and conſequently is incapable of bringing them all up. The word is alſo applied to a colt, calf, &c.

In either of theſe caſes, if there be not another ewe at liberty to ſuckle it, it muſt be brought up by hand, or periſh. By an ewe at liberty is meant one that has, by ſome accident, loſt her lamb, and has milk enough to ſuckle a lamb yeaned by another.

COSTIVENESS, a complaint to which horſes are often ſubject; ſometimes occaſioned by violent and hard exerciſe, eſpecially in hot weather; and ſometimes by ſtanding long at hard meat, without graſs, or other cleanſing diet, and with very little exerciſe.

The cure for this complaint is eaſy, only by giving him an open diet for ſome time; and if any thing more is wanting, lenitive mild purges are the moſt likely to ſucceed. Such as Glauber's ſalts with lenitive electuary, four ounces of each, diſſolved in warm ale or water, and repeated every other day. This, with ſcalded bran given every day, will ſoon remove the complaint, and carry off the viſcid ſlime engendered in the guts, which is generally the cauſe of his coſtiveneſs.

But there is another kind of coſtiveneſs in horſes, which is much harder to be removed, viz. that which ſeems to be natural, or grown into a habit. We find ſome very good horſes liable to this diſorder; and, when it is of long continuance, they are apt to grow lean and emaciated, feel hot and dry, their hair ſtaring, and there is danger of ſome approaching ſickneſs.

This diſorder is not eaſily removed; nor is it often neceſſary to bring ſuch horſes into a contrary habit; for where this is natural, it may proceed from a more than ordinary ſtrength and rigidity in the ſmall fibres of the ſtomach and guts, which makes them digeſt their aliment well, and retain their excrements longer; and when ſuch a habit can be kept within any proper medium, the horſe will continue in ſtrength and vigour, without any inconvenience; and it is obſervable, that theſe horſes are, for the moſt part, able to endure great fatigue and labour. However, it is proper to give ſuch horſes, at all convenient times, an opening diet. For if this habit happens, by any accident, to grow into an habitual coſtiveneſs, ſo as to produce ill effects, as heat, dryneſs of the conſtitution, little ſcabby eruptions over the ſkin, and a rough coat, it will then be neceſſary to remove it in ſome degree, which cannot be done but by a continual uſe of emollients, joined by a looſe opening diet.

Purging is here alſo neceſſary, and ought by all means to be complied with; but purging in the common way with Barbadoes or other plantation aloes, ſeldom has any great effect longer than the purge is working; for when that is over, the ſame habit of coſtiveneſs generally returns as ſtrong as ever. Scalded bran, and the common opening diet, ſeldom makes any great alteration in theſe horſes. The aloetic purges will ſcarcely work, eſpecially if they are made ſtrong, for they then chiefly run off by urine, which does the creature little ſervice in this caſe. But after the common purges have failed, the following will ſucceed beyond expectation.

Take ſuccotrine aloes, ſix drams; ſpermaceti, half an ounce; fœnugreek-ſeeds in powder, two ounces: make the whole into two balls, with a ſufficient quantity of honey, or common treacle, and give them in a morning faſting.

Let the horſe have ſcalded barley inſtead of ſcalded bran, and the liquor of the barley for his drink, milk warm. This will work very gently, where ſtronger purges have little other effect upon coſtive horſes than to gripe and make them ſick. It ought to be repeated once in four days, and may be continued till he has taken ſix doſes. Let him have an ounce of fœnugreek-ſeeds once a day, in one of his maſhes, and when the purgation is over, continue the uſe of the fœnugreek; and ſometimes give linſeed in the ſame manner, either in his dry or moiſt feeds, until the horſe grows ſmooth and well coated, and his dung moiſt and in good order. *Gibſon's Farriery, vol.* II. *p.* 134.

COTYLEDONS, rinds, or huſks.

COUCH-GRASS, *quick-graſs*, *knot-graſs*, or *dog-graſs*, is one of the worſt of weeds among corn, and one of the moſt difficult to extirpate in arable land; every joint of its long creeping roots being capable of ſoon producing a new plant, after thoſe roots have been broken by the plough. The uſual way of deſtroying it, is by laying the land fallow in ſummer, and frequently harrowing it well over, to draw out the roots, every piece of which ſhould then be burnt, for the reaſon already mentioned. Where this is carefully done, the ground may be ſo well cleanſed in one ſummer, that the remaining roots will not do any great injury to the enſuing crop: but the beſt way is to ſow the land in which this weed prevails with ſuch plants as require the horſe-hoeing culture. The blade of this graſs is ſo rough, that cattle will not feed upon it when green.

COVERT, ſheltered, not open, not expoſed.

COUGH, a convulſive motion of the lungs, being an effort of nature to throw up ſome offending matter.

Horſes are very ſubject to coughs, which are ſometimes occaſioned by colds, and often by the injudicious treatment of an inflammation of the lungs; the conſequence of which is often ſettled habitual coughs, which frequently degenerate into aſthmas, and broken wind.

Nothing has more perplexed practitioners than the cure of settled coughs; the cause of which, perhaps, has been their want of attention to the different symptoms which distinguish one cough from another; for, without strict observance thereof, it is impossible to find out the true method of cure.

Thus, if a horse's cough is of long standing, attended with loss of appetite, wasting of flesh, and weakness, it denotes a consumption; and that the lungs are full of knotty, hard substances, called tubercles, which have often been discovered on dissection.

The following signs denote when the cough proceeds from phlegm, and slimy matter, that stuff up the vessels of the lungs.

The horse's flanks have a sudden quick motion; he breathes thick, but not with his nostrils open, like a horse in a fever, or that is broken-winded; his cough is sometimes dry and husky, sometimes moist, before which he wheezes, rattles in the throat, and sometimes throws out of his nose and mouth great gobs of white phlegm, especially after drinking, or when he begins or ends his exercise, which discharge commonly gives great relief. Some such horses wheeze and rattle to such a degree, and are so thick winded, that they can scarce move on, till they have been out some time in the air; though then they will perform beyond expectation.

These are properly asthmatic cases, and ought to be distinguished in their symptoms from that pursiveness and thick windedness we see in some horses, occasioned by too full, or foul feeding, want of due exercise, or their being taken up from winter's grass. But these two last cases are easily cured by proper diet and exercise; the one by lowering his keeping, and the other by increasing it.

The above asthmatic case proves often very obstinate; but, if it happens to a young horse, and the cough is not of long standing, it is greatly relieved, if not totally cured, by the following method.

If the horse is full of flesh, bleed him plentifully; if low in flesh, more sparingly; which may occasionally be repeated, on very great oppressions, and difficulty of breathing, in proportionate quantities.

As mercurial medicines are found remarkably useful in these cases, give a mercurial ball, with two drams of calomel, over night, and a common purge the next morning: or the following, which is much recommended by Mr. Gibson:

Take gum-galbanum, ammoniacum, and assa-fœtida, of each two drams; fine aloes, one ounce; saffron, one dram; oil of anniseeds, two drams; oil of amber, one dram; with honey enough to form into a ball.

They may be repeated at proper intervals, with the usual cautions. In the intermediate days, and for some time after, one of the following balls may be given every morning:

Take cinnabar of antimony, finely levigated, six ounces; gum-ammoniacum, galbanum, and assa-fœtida, of each two ounces; garlic, four ounces; saffron, half an ounce: make into a paste for balls, with a proper quantity of honey.

These balls are extremely well calculated for this purpose: but if they are thought too expensive, the cordial ball may be given, with an eighth part of powdered squills and Barbadoes tar: or equal quantities of the above, and cordial ball may be beat up together; and where they can be afforded, balsam of Peru, balsam of sulphur, and flower of Benjamin, would undoubtedly, added to the cordial ball, make it a more efficacious medicine, in cases of this sort, as thus:

Take of the pectoral or cordial ball, one pound; balsam of Peru, half an ounce; balsam of sulphur anisated, one ounce; flower of Benjamin, half an ounce: honey as much as is sufficient to form them into a paste: give the size of a pigeon's egg every morning.

Exercise in a free open air is very serviceable, and the diet should be moderate. Horses subject to any inward oppressions of the lungs, should never be suffered to have a belly full; that is, they should never be permitted so to distend their stomach with meat or water, as to press against the midriff; which of course would hinder respiration. Their hay should even be abridged, given in small quantities, and sprinkled with water; and their usual allowance, both of corn and water, should be divided into several portions: by such a regulation in diet, horses may be so recovered as to do great service; and in all disorders of the lungs, it is what should principally be attended to.

The following are the symptoms of a dry cough, or asthma.

The horse afflicted with this cough, eats heartily, hunts, and goes through his business with alacrity, appears well coated, and has all the signs of perfect health; yet he shall cough at particular times almost incessantly, without throwing up any thing, except that the violence of the cough will cause a little clear water to distil from his nose. Though this cough is not periodical, yet some of these horses cough most in a morning, after drinking.

This may properly be stiled a nervous asthma in a horse, as probably it chiefly affects the nerves in the membranous parts of the lungs and midriff; and is a case very doubtful at least, if not incurable: but when the horse is young, the following method may be successful:

Take away first a moderate quantity of blood; then give him two drams of calomel, mixed up with an ounce of diapente, for two nights; and the next morning a purging ball. Keep him well cloathed and littered, and feed him with scalded bran and warm water.

Once in eight or ten days this purge may be repeated, with one mercurial ball only, given over night.

The following balls may then be taken, one every day, about the size of a pullet's egg, the horse fasting two hours afterwards; and should be continued two months, or longer, to be of real service:

Take native cinnabar, or cinnabar of antimony, half a pound; gum-guaiacum, four ounces; myrrh, and gum-ammoniacum, of each two ounces; Venice soap, half a pound: the cinnabar must be finely levigated, as before observed, and the whole mixed up with honey, or oxymel squills.

The following also will be found a useful remedy in obstinate dry coughs:

Take gum-ammoniacum, squills, and Venice soap, of each four ounces; balsam of sulphur, with anniseeds, one ounce; beat up into a mass, and give as the former.

These mercurial and ponderous medicines are well adapted to open obstructions in the lungs, and prevent those little knots, or tubercles, which so frequently ulcerate, and lay the foundation of an incurable malady, or consumption; but the common pectorals alone will avail nothing in old stubborn coughs, their efficacy being lost in the long tour they have to make, before they come to the lungs; and indeed, were it otherwise, without they had such powerful openers joined with them, they would be of little consequence; for where there are expectations from medicines, such are chiefly to be relied on, which have a power of dissolving and attenuating the viscid humours, opening the small obstructed vessels, and promoting all the natural secretions.

Before we conclude this article, it may be necessary to observe here, that some young horses are subject to coughs on cutting their teeth, their eyes also are affected from the same cause. In these cases always bleed, and if the cough is obstinate, repeat it, and give warm mashes; which, in general, are alone sufficient to remove this complaint. But when the cough is an attendant on worms, as it often is in young horses, you must give such medicines as have a power to destroy those animals; particularly mercurial physic, at proper intervals, and intermediately half an ounce of Æthiop's mineral, mixed up with the cordial; or pectoral balls may be given every day. *See* WORMS. *Bartlet's Farriery, page* 51.

But horses are not the only animals subject to this disorder: it is so common among sheep, that one seldom passes near a flock without hearing it in several. They cure this disorder in the Ardennes by throwing up their nostrils with a syringe blanched almonds pounded in wine, for six or eight days successively.

COUPLES, ewes and lambs.

COW, the female of the bull.

Cows are very ſerviceable to the huſbandman for work, and for the ſupply of the family and market. The beſt breed is reckoned that of Yorkſhire, Derbyſhire, Lancaſhire, Staffordſhire, &c. and a good hardy ſort for fatting on barren, or middling ſort of land, are your Angleſey's and Welſh. The hardieſt are the Scotch; but the beſt ſort of cows for the pail, only they are tender, and require very good keeping, are the long-legged, ſhort-horned cow, of the Dutch breed, which is to be had in ſome places of Lincolnſhire, but moſtly in Kent; many of theſe cows will give two gallons of milk at a meal: but in furniſhing yourſelf with cattle, you ought to conſider the goodneſs of your land, and the uſe you deſign your cattle for, as whether for breed, milk, or work.

If for breed, the better your land is, the larger may your kine be; and the cheaper, the more will be your profit: only obſerve, that of what kind ſoever your breed is, that it be the beſt of the ſort, and let your bull be of the ſame country with your cow, for a mixed breed is not reckoned to be ſo good.

The cow ought to have a broad forehead, black eyes, large clean horns, her neck long and thin, a large deep belly, thick thighs, round legs, ſhort joints, a white large deep udder, having four teats, and her feet large. As for the ſize of your cows, as of all other cattle, it muſt be ſuited to the goodneſs of your land, though the largeſt commonly give the moſt milk: and whether you deſign them for breed, fattening, or the dairy, let them be ſuch as come off a worſe ground than your own, if poſſible. The beſt time to breed calves is from three years old to twelve. *See the article* CALVES.

For a fortnight or three weeks before a cow calves, put her into good graſs; or, if it be in winter, give her hay; and be ſure to keep her in the houſe the firſt day and night after ſhe has calved, and let a little of the cold be taken off the water which you give her: the next day, if well, and ſhe be well cleaned, turn her out about the middle of the day, and take her in two or three nights more, giving her water a little warmed every morning, before you turn her out. *Mortimer's Huſbandry, vol.* I. *p.* 225.

COW-LEASE, paſture, or meadow ground, kept for feeding of cows.

COWHERD-MILK, implies milk received from the hands of the cowherd, a perſon whoſe office it is to attend upon, and look after, the herd of cows in places where they run in common.

COWL, a term uſed in ſome counties of England to ſignify a tub.

COW-PARSLEY, the name of a plant common in paſture grounds, and of which cows are ſaid to be very fond. This plant ſhould be rooted out of all paſtures, for it is one of the moſt early plants in ſhooting, ſo that by the beginning of April its leaves are near two feet high. The ſeeds of this plant ſpread greatly over the ground, and as the roots are perennial, ſo they are often very troubleſome weeds to deſtroy.

COW-PARSNIP, *wild parſnip*, *meadow parſnip*, or *madrep*, the name of a weed that grows to near three feet high. The ſtalk is round, furrowed, and hollow. The leaves proceed from a large membrane or ſheath. They grow on long hairy ſtalks, and are divided and downy. The flowers grow in large umbels, are white, and conſiſt of five irregular petals: two oval, ſtreaked, compreſſed ſeeds, ſurrounded by a wing, ſucceed each flower.

COW-WHEAT, by ſome called *fox-tail*, is a pernicious weed in many countries. Its ſeed is ſomething like wheat, and according to Cluſius, ſpoils the meal with which it is ground, by giving it a dark colour, and a bitter taſte: though Mr. Ray ſays he could never perceive any diſagreeable reliſh in the bread with which it was mixed. Mr. Miller ſays it is a delicious food for cattle, particularly for fattening of oxen and cows, and that it may be worth while to cultivate it for that purpoſe.

Its ſeeds ſeldom grow the firſt year, unleſs they chance to be ſown, or ſow themſelves, in the autumn, ſoon after they are ripe.

CRADLE, a part often added to a ſcythe, the better to gather the corn, when low, into ſwarths, when it is mowed.

CRAGG, *cragge*, a name given in Suffolk to the remains of marine ſhells, of various kinds, and in which the greater part of the Britiſh cliffs abound.

This is a very excellent manure for cold, wet, or clay land; ſo that every farmer would do well to ſearch his grounds, in order to know whether he is, or is not, poſſeſſed of this treaſure, which will inſure him of very large crops of corn, though his lands were before worn out by continual labour.

CRAKE, a name given in the northern counties to the crow.

CRAKE-NEEDLE, the ſhepherd's needle; or rather the ſeed-veſſels of it.

CRANE'S-BILL. *See* CROWFOOT, CRANE'S-BILL.

CRAP, a name given in ſome parts of England to darnel; and in others to buck-wheat.

CRATCH, or *critch*, a rack.

CREAM, the unctuous, or oily part of milk.

CUBBITTING, a vice to which ſome horſes are ſubject; conſiſting in their catching hold of the manger, ſucking in of the air, and ſwallowing it down in gulps, till they are often ſo full that they are ready to burſt. Some do it only on their collar reins, and ſome on every poſt and gate they come at.

This vice is more common in London than any where elſe, and may either come upon horſes from very low feeding, while they are young and have appetites, or perhaps by ſtanding much at the crip while they are ſhedding their teeth; for then their mouths are hot, and their gums tender and itching, which may readily make them ſuck in the air to cool their mouths: but young horſes are the more apt to imbibe this ill habit, when they ſtand next thoſe that do it; for young horſes often follow others. Horſes addicted to this vice are but of ſmall value; they drop a great part of their food unchewed, which makes them almoſt always look lean and jaded, with a ſtaring coat, and conſequently few of them are able to endure much labour; beſides their being frequently ſubject to the gripes, and other diſorders, owing to their continual ſucking in the air. There is no method yet known, that has proved effectual in the cure of this vice. *Gibſon on Horſes, vol.* I. *p.* 40.

CRESSES, are of various kinds; but the common garden creſs, the Indian creſs, and the water-creſs, are the ſorts uſed for the table.

The common garden creſs, pretty generally cultivated as a ſallad herb, is moſt eſteemed in the winter and ſpring, becauſe it is one of the warm kind. It is propagated by its ſeeds only. If raiſed in the winter ſeaſon, it muſt be ſown upon a gentle hot-bed, and covered ſo as to defend it from great rains or froſt, both of which are equally deſtructive to it in that ſeaſon. If it be not raiſed till the ſpring, it may then be ſown in warm borders, well fenced from all nipping winds: but if it is to be continued in the ſummer, it muſt be ſown upon ſhady borders; and this ſowing ſhould be repeated every third day, or it will ſoon be too large for uſe, as it grows very faſt at that time of the year.

A curled ſort of this plant is propagated in ſome gardens, more for curioſity, and to garniſh diſhes, than for any real uſe; for the common ſort is full as good. This curled creſs ſhould not be ſown quite ſo thick as the other, and when its plants are come up, they ſhould be thinned, ſo as to leave the remaining ones at leaſt half an inch aſunder, that they may have room to expand their leaves. To preſerve this curled variety unmixed, all ſuch plants of it as ſeem to have a tendency to degenerate muſt be pulled up as ſoon as they are noticed.

The beſt method of ſowing both theſe ſorts of creſſes is in drills, becauſe it will then be eaſieſt to cut them as they may be wanted. Their ſeeds, which are very ſmall, ſhould be but barely covered with earth; and to ſave theſe ſeeds when they are ripe, the plants ſhould be drawn up, ſpread upon a cloth, and dried in the ſun for two or three days. They may then be eaſily beaten out; and they ſhould be kept in a dry place.

The Indian creſs (commonly called naſturtium, which is the right botanic name of the garden creſs, as tropæolum is the proper appellation of this,) is an annual plant, ſeldom propagated otherwiſe than by its ſeeds; though it may be continued through the winter, if kept in pots, and ſheltered in a good green-houſe, and there it may be multiplied by cuttings, as is ſometimes practiſed with the double flowered ſort. But this is not worth while, as the ſeeds ripen every year, and plants are eaſily raiſed from them. They are often raiſed in hot-beds about the end of March, or the beginning of April, and then tranſplanted: but they may be ſown in April, in the places where they are to remain. This, for the ſake of ornament, and that no ſmall one in a kitchen-garden, ſhould be where their ſtalks may find ſupport, for they will climb up to the height of ſix or eight feet, and make a very pretty appearance when their flowers are blown. Thoſe of a deep orange colour, inclining to red, are leſs common now, in this country, than the larger ſort with a pale yellow flower; this laſt being generally preferred on account of it's ſize. Theſe flowers have a warm taſte like the garden-creſs. They are commonly uſed for garniſhing of diſhes, and are frequently eaten in ſallads. Their ſeeds fall off as ſoon as they are ripe, and are excellent when pickled. Some call them capuchin capers.

The water-creſs, which grows naturally in ditches and rills of water in moſt parts of England, is much eſteemed as a ſallad herb in the ſpring of the year. Many people even prefer it to all other ſallatting of that ſeaſon, for its agreeable warm bitter taſte, and becauſe it is reckoned an excellent anti-ſcorbutic, a great cleanſer of the blood, and a good diuretic. The editor of the laſt edition of Mr. Mortimer'sHuſbandry ſays, that water creſſes, freſh gathered, and eat faſting in a morning, have performed wonders in conſumptive caſes; and he judiciouſly recommends to ſportſmen, or others, who ſtay long in the fields in cold weather, to gather them out of the ſprings where they grow, and eat them, as a better cordial to warm the ſtomach, than any dram of ſpirituous liquors.

Water creſſes are eaſily cultivated, by taking ſome of the plants, entire, from the place of their natural growth, early in the ſpring, with all their roots to them, then ſetting them in mud, and letting water in upon them by degrees, ſo as at length to form a kind of pond, if it cannot be continued as a running ſtream; though few ſpacious grounds are without ſome brook or other, along the ſides of which they will grow perfectly well. After they have taken root, they will ſoon multiply, eſpecially if they be not cut the firſt ſeaſon, but ſuffered to ripen their ſeeds; for theſe will fall into the water, and afterwards afford a ſufficient ſupply of plants. If the water is too deep to admit of planting them with eaſe, and if it be not a running ſtream, the beſt way is to throw upon its ſurface, at the places where it is deſired they ſhould grow, ſome of the plants taken from elſewhere juſt as their ſeeds are coming to maturity: for they will there complete their ripening, ſink to the bottom, and produce a plentiful growth of creſſes.

Incautious perſons have, not unfrequently, ſuffered in their health, by eating the leaves of the creeping water parſnip, inſtead of thoſe of the water creſs. To guard againſt this miſtake, which may chance to prove fatal, it is proper to obſerve, that the leaves of the right water creſs are roundiſh, almoſt heart-ſhaped, ſmall, with few indentures on their edges, and of a dark green colour; whereas thoſe of the water parſnip are oblong, pretty ſharp pointed, ſawed at their edges, and of a light green colour.

CRIBBLE, coarſe meal, or that but one degree better than bran.

CROFT, a ſmall field or incloſure. In the northern counties it is uſed as a ſmall cloſe or incloſure, one end of which contains the dwelling-houſe and kitchen garden.

CRONES, old ewes.

CROP, the produce, or the quantity of corn, graſs, &c. growing on any parcel of land.

CROSS-TINING, a method of harrowing land, conſiſting in drawing the harrow up the interval it went down before, and down that which it was drawn up.

CROTCH, a hook.

CROW, an iron bar, with a claw at one end, uſed as a lever, and for making holes in the ground, &c.

CROW-FOOT, or CRANE'S-BILL, the name of a perennial weed common in paſtures. The leaves are divided almoſt to the middle, uſually into ſeven parts. The ſtalk commonly divides into two branches; and each of theſe into two more. From the corner of each diviſion comes a flower-ſtalk, ſupporting two large blue flowers; conſiſting of five roundiſh, intire petals, ſucceeded by a long ſeed-veſſel, reſembling a crane's-bill. This bill-like ſeed-veſſel is thick and rough; but not ſo long as in ſome other plants.

CROWS. *See the article* ROOKS.

CROWN-SCAB, a diſeaſe in horſes, conſiſting in an humour, that breaks out round the coronet; of a very ſharp and itching nature, and attended with a ſcurfineſs. Sharp waters prepared with vitriol are generally uſed for the cure of this diſorder: but the ſafeſt way is firſt to mix equal parts of marſhmallow ointment and yellow baſilicon together, ſpreading the compoſition on tow, and laying it all round the coronet. A doſe or two of phyſic may be very proper, to carry off the humour. *Bartlet's Farriery, p.* 296.

CUCUMBERS, a well known plant, cultivated in moſt kitchen gardens.

Cucumbers, for very early ſhew, that is to ſay, to decorate the table at a time when no prudent man would chooſe to eat them, are nurſed in ſtoves by ſome fantaſtical gentry, who pique themſelves on having this fruit fit to cut in every month of the year. But I ſhall here content myſelf with relating the more rational, and far leſs troubleſome, practice of thoſe who have patience to wait till they can be produced in the natural ſeaſons.

To have as early cucumbers as the not too much forced courſe of vegetation can yield in this country, their ſeeds ſhould be ſown, about the middle of March, or a little later if the ſpring be backward, either under a bell glaſs placed upon a ſpot of hot-bed, or at the upper end of a more regular hot-bed covered with frames, where they will not then take up the room of other plants. It is neceſſary that the due temperature of the hot-bed ſhould be attended to here and when theſe plants are come up, they ſhould be tranſplanted into another moderate hot-bed, at the diſtance of about two inches aſunder. Here they ſhould be covered with bell or hand glaſſes ſet quite cloſe to each other, and they ſhould be ſhaded, and ſparingly watered, until they have taken root. They ſhould alſo be aired, as much as the weather will permit, by raiſing up the ſide of the glaſs oppoſite to the wind, in order to ſtrengthen them, and when they have begun to put out their rough leaves, they muſt be re-tranſplanted on the ridges where they are to remain.

Theſe ridges are made with new horſe-dung, in the ſame manner as before directed for the hot-bed, excepting that they are neither ſo thick nor ſo wide. About two feet four inches will be ſufficient for the breadth of the trenches in which they are made; but their length may be whatever is moſt convenient, according to the number of plants intended for them. The trenches for theſe ridges ſhould be about ten inches deep in dry ground; but very little earth need be dug away for them if the ſoil is wet. About one cart load of dung will make a ridge long enough for five or ſix holes of cucumbers, at the diſtance of about three feet and an half from each other. This ridge of dung, being well beaten down and levelled at top, ſhould be covered with about four inches deep of earth, of which the ſame thickneſs ſhould alſo be laid over its ſides. Hillocks of mould ſhould then be raiſed up in the middle of the ridge, at every diſtance at which the plants are to be ſet; and after theſe have been cloſely covered with the glaſſes during four and twenty hours, in order to warm the earth, and thereby fit it for the reception of the plants, they ſhould be ſtirred up by hand, ſo as to make a little hollow in the middle of each, in the form of a baſon. Four plants ſhould then be ſet, as far as can be from each other, in each of theſe hollows, where they muſt again be watered and ſhaded until they have taken root; and after this they muſt be aired, by raiſing the glaſſes on the ſide oppoſite to the wind, in proportion to the warmth of the weather: but they ſhould be raiſed thus only in the middle of the day, until the plants begin to fill them;

for

for after that, they ſhould be propped up with a forked ſtick on the ſouth ſide, to a height proportioned to the increaſe of the plants, which muſt be carefully preſerved from being ſcorched by the ſun. This will alſo harden and prepare them for the open air, to which they ſhould not, however, be expoſed too ſoon, becauſe we frequently have morning froſts in May, which they would not be able to reſiſt. Rather than run any hazard of this kind, the glaſſes ſhould be kept over them as long as can be without damaging the plants; and this may be for a conſiderable time, if the glaſſes are raiſed all round, by ſetting them on three bricks.

About the end of May, when the weather begins to be ſettled and warm, and rather in a cloudy day which ſeems to promiſe rain, than in a very dry and ſunny one, the plants ſhould be gently turned down from out of the glaſſes; and theſe ſhould then be ſupported over them at the height of four or five inches from the ground, by three forked ſticks, which will hold them up very ſecurely, and prevent their bruiſing the ſhoots of the plants underneath: for it is beſt not to remove the glaſs entirely before the latter end of June or the beginning of July, becauſe they will preſerve a moiſture about their roots much longer than if they were quite expoſed to the open air. The plants thus turned down will have made a conſiderable progreſs by the end of three weeks, eſpecially if the weather has been favourable; and then it is that the ſpaces of ground between the ridges, or along the ſides of the ridge if there be but one, ſhould be dug up, and added to the bed, or beds, that the roots of the plants may be enabled to ſtrike into it; for they will extend themſelves a great way (ſome ſay as far as the vines,) if they are not cramped. The runners of the vines ſhould be laid in exact order, without tumbling them too much, or bruiſing, or breaking of their leaves. Some pin them down gently with little wooden hooks, to prevent their being blown about by the wind. After this, they will require no farther care, except keeping them clear from weeds, and watering them when neceſſary, that is to ſay, when their greater leaves drop and hang down to the ground. But here it is to be obſerved, that, though pretty frequent watering of them increaſes their fruitfulneſs, they are beſt taſted, and wholeſomeſt, when they have had but little water; and, though they ſhould be watered ſometimes in dry weather, they ſhould be carefully defended from rain when it is cold. The ridges thus managed will yield large quantities of fruit, from June till the latter end of Auguſt. Mr. Mortimer recommends nipping of the top ſhoots of cucumber plants after they have put out three or four joints, as a means of making them knit the ſooner for fruit.

It is from cucumbers planted on ridges, like the above, that moſt of the gardeners about London ſave their ſeeds. To this end, they leave a number of the earlieſt and fineſt fruit upon the vines, until their ſeeds are perfectly ripe; and then, when the outer cover begins to decay, they cut them open, and ſcrape out their ſeeds, with the pulp, into a tub, which they cover over with a board, to keep out all filth. They let theſe ſeeds and pulp remain thus for eight or ten days, only ſtirring them well with a ſtick, to the bottom, every day, in order to rot the pulp, and make it ſeparate the more eaſily from the ſeeds. They then pour water into the tub, and ſtir the whole well about, till there ariſes a ſcum, after which they let the ſeeds ſettle to the bottom, and pour off the water. This they repeat two or three times, till the ſeeds are perfectly cleared from the pulp. They then ſpread them upon a mat expoſed to the ſun and open air for three or four days, till they are quite dry, and after this they put them into bags, and hang them in a dry place, where vermin cannot come to them. They will keep good for ſeveral years, but are thought to produce the leaſt luxuriant, and therefore moſt fruitful, plants, when they are three or four years old.

To avoid the trouble of making beds, or ridges, of dung on purpoſe for them, as above deſcribed, (which is undoubtedly the ſureſt way to have early fruit), many people, who are leſs ſollicitous about the earlineſs, or even the great plentifulneſs of theſe crops, than the trading gardeners about London are obliged to be, only dig holes of the ſize of a buſhel, fill them with warm ſtable dung, then ſet in the middle of them four or five cucumber plants, with as much mould as poſſible about their roots, and afterwards earth them up in the form of a baſon, to render the watering of them more effectual. They ſhade them till they have taken root, and cover them for a while with bell or hand-glaſſes, if they have any; or they even truſt them at once to the open air. If the plants thrive, three of them will be ſufficient in a hole; and then the reſt of them may be plucked up, or tranſplanted elſewhere. Some even raiſe them from their ſeeds planted in holes of this kind, without any previous hot-bed, and they do very well, if the ſeaſon be at all favourable.

The time for ſowing the latter crop of cucumbers, commonly called picklers, is the beginning of June. The London gardeners generally ſet theſe between their wideſt rows of cauliflowers, which are four feet and a half aſunder. To this end, they dig ſquare holes about three feet and an half from each other, breaking the earth well, and hollowing the ſurface of each hole, with their hands, till it is like a baſon. They then plant eight or nine ſeeds in the middle of each of theſe ſpots, and cover them with earth to the thickneſs of about half an inch. If the weather is very dry, they water them gently at the end of a day or two. In five or ſix days the plants will appear above ground; and particular care muſt be taken then to defend them from birds, eſpecially ſparrows, which will otherwiſe ſoon pinch them off, and thereby fruſtrate all expectations of a crop: but this danger will be over in little more than a week; for the ſparrows will not meddle with them after they have expanded their ſeed-leaves. Care muſt alſo be taken to continue to water them gently, from time to time, according as the ſeaſon is more or leſs dry; and when they begin to ſhew their third leaf, which is the firſt of their rough ones, all the weakeſt plants ſhould be pulled up, leaving in each hole only four of the moſt promiſing and beſt ſituated. The ground about theſe ſhould then be well ſtirred with a ſmall hoe, to deſtroy the weeds, and earth up the plants, around the ſtems of which the mould ſhould afterwards be gently preſſed down by hand, the better to ſeparate them from each other as much as can be without hurting them. This being done, they are watered a little to ſettle the earth about them, and at ſuch other times as the dryneſs of the weather may render neceſſary: but, above all, they muſt be kept clear from weeds. When the cauliflowers are quite removed, the whole ground ſhould be thoroughly hoed and cleaned, freſh earth ſhould be laid up around the plants, ſo as to deepen the hollows in which they ſtand, that they may the better contain water when it is given them, and their vines ſhould be ſpread out carefully in the order they are to run, in ſuch manner that they may not croſs or be entangled with one another. A little earth ſhould then be laid, and gently preſſed down, between the plants, the better to ſeparate them every way, and a gentle watering now, and as often afterwards as the ſeaſon ſhall require, will forward their growth. With this management, theſe plants will begin to yield young cucumbers, fit for pickling, about the latter end of July, or early in Auguſt.

About fifty or ſixty of theſe holes will be neceſſary for a middling family; becauſe a ſmaller number of them will not afford fruit enough at one gathering to requite the trouble and expence of pickling, and they never are ſo good if they are gathered long before they are put into the vinegar. Fifty holes will ſeldom furniſh more than two hundred cucumbers fit to gather at a time; and this may be repeated twice a week as long as the ſeaſon laſts, which generally is five weeks. What are not wanted for pickling, may be left to grow till they become fit to eat.

Though M. Duhamel has not given us any experiments on the culture of cucumbers according to the principles of the new huſbandry, there can be no room to doubt of their ſucceeding perfectly in that way, ſince M. de Chateauvieux raiſed excellent melons, which are a much more tender fruit, in beds of common earth, in open fields, merely by keeping the ground in fine order by a judicious uſe of the horſe-hoe, without the help of either dung, hot-bed, or glaſſes over them, and they were, in all reſpects, preferable

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to any in his garden. This furely merits the attention of all kitchen gardeners, and fingularly of thofe near London, where land and labour bear extraordinary prices.

A correfpondent of the editors of the Mufeum Rufticum has given us the following new method of raifing cucumbers, without the help of forcing frames, though the fruit are much finer than any raifed by the other methods yet in ufe. "I procured, fays he, fome of the beft feed of the common prickly cucumbers I could get; and from this feed, in the fpring of the year 1750, I raifed fome plants on a moderate hot-bed, not hurrying them too much in their growth.

"In May, when the danger of the froft was almoft over, I familiarized the plants by degrees to the air, and towards the latter end of the month planted them in the open ground againft a fouth wall.

"In this fituation they throve apace, and as faft as they put forth their runners, I nailed them gently up againft the wall. They did not fend forth many bloffoms till they had run a confiderable height, at leaft five feet; after which the fruit began to fhew itfelf.

"I did not give my plants too much water, and this I have fince found a neceffary precaution.

"The fruit increafed in fize daily, was of a fine green colour, and differed greatly from that of fome other plants raifed from the fame feed, but planted in the common way; the runners being fuffered to trail on the ground.

"When I gathered my firft cucumber, I was exceedingly delighted with its appearance. It was long, thin in proportion to its length, of a beautiful green, not too deep, with a whitifh fummit.

"When I cut it I found the flefh thick and firm, but few feeds, and thofe very fmall, and its flavour extremely delicious.

"Defirous of knowing whether the plant might not be improved by fowing the feeds of fruit raifed in this manner, I pitched upon fome of the fineft cucumbers, not at too great a diftance from the roots, and left them on the vine to perfect their feed.

"In this manner I have raifed cucumbers for my own ufe ever fince, and have the fatisfaction to find, that inftead of degenerating, they have improved furprifingly.

"My neighbours in the country are exceeding glad when I have any feed to fpare for them, and always find their cucumbers that year much better for ufing it, though they do not grow fo large as mine, neither have they fo delicious a flavour, unlefs nailed up againft a wall.

"I am very fenfible that this method cannot, with any degree of convenience, be brought into general practice; yet, in every garden, a few plants may be fo trained to prevent the feed from degenerating; efpecially as one or two plants raifed in this manner would fupply a fufficient quantity of feed for a large garden.

"I muft own, that in my method the plants do not bear fo great a number of cucumbers as in the common way; but then they are, without comparifon, larger, and of an exquifite flavour." *Mufeum Rufticum, vol.* I. *page* 131.

CUCKOW-FLOWER. *See the article* LADIES SMOCK.

CUCKOW-LAMBS, a name given in Hertfordfhire to fuch lambs as are yeaned in April or May, becaufe they fall in cuckow time. They are generally either the lambs of very young, or very old fheep, and occafioned by their taking ram very late in the feafon. Thefe lambs are ufually of the fmalleft fort, and therefore both ewe and lamb fhould have the beft of keeping, in order to fatten the lamb for the butcher; for fuch diminutive lambs are improper to be kept for ftore-fheep. Befides, as thefe lambs are yeaned later than ordinary, it is very likely they will meet with green meat fufficient to fatten them apace, and come in feafon to be fold for the more money; as they are of the youngeft fort, and fatted late. *Ellis on Sheep, page* 79.

CUCKOW-SPIT, a kind of frothy fubftance frequently found on plants, containing one or two infects.

M. Poupart tells us, that as foon as the little creature comes out of its egg, it haftens to fome plant, which it touches with its fundament, and faftens there a drop of white liquor full of air; it drops a fecond near the firft, then a third, and fo on, till it covers itfelf all over with a fcum or froth: this froth defends it from the heat of the fun, and alfo from the attacks of the fpiders, which would otherwife devour it. Mr. Lifle is of opinion, that this froth is nothing more than the nightly dew which falls upon the fork or joint of the plant, and which the little infect, with its probofcis, as with a pair of bellows, works into froth.

CULMIFEROUS *Plants*, fuch as have a fmooth jointed ftalk, and their feeds are contained in chaffy hufks.

CULTIVATION, the art of improving foils, and forwarding or meliorating the produce of the earth, by manual labour, manure, &c.

CULTIVATOR, a name given by foreign hufbandmen to inftruments invented for ftirring the earth, on the principles of the new hufbandry. Thefe inftruments are generally called in England horfe-hoes. We fhall here give a defcription of thofe invented by Meffrs. de Chateauvieux and de Villiers, and defcribe thofe invented in England under the article horfe-hoe. *See* HORSE-HOE.

Defcription of M. de Chateauvieux's *fingle* CULTIVATOR.

M. de Chateauvieux, having remarked the good effects of his plough in ftirring the alleys between the rows of corn, rightly judged, that the inftrument we are now going to defcribe, which is much lighter and fimple in its make, would anfwer the fame end; or at leaft that it might be ufed alternately with that plough, employing this laft only when a greater quantity of earth is to be turned up towards the rows of corn: "for, fays he, it is to be obferved, that the cultivator hardly changes the fituation of the earth, but divides and breaks it in the place it is in, fo as to render it loofe and light, and fit for the roots of plants to penetrate with eafe. This inftrument, like a miner, works chiefly under ground, where it cuts the earth, divides its particles, raifes it up, and lightens it. It has this farther advantage, that one horfe is fufficient to draw it. The cultivator, Plate VII. is compofed of a beam, AB, Fig. 1. the handles CD, and the fhare EF, which is more particularly reprefented in Fig. 2, 3, 4, 5, and 6.

"The beam AB is three feet and a half, or four feet long. Its diameter ought not to exceed three inches at moft; and, if it be fquare, the edges fhould be rounded off. It fhould be pierced with mortifes under the letters G, H, in order to let through the crofs ftaves I, L; in the fame manner as in the fore-carriage of the plough; and is fixed by the keys K, M, or the pins *a*, *b*. The middle of the handles fhould be exactly oppofite to the beam; that is to fay, the fpace between them fhould be equal on both fides. Thefe handles fhould be made flighter than thofe of the plough before referred to, and they fhould be fixed to the beam by a tenon in a mortife, rivetted at N, and fupported behind by the prop P.

"The end A of the fhare, Fig. 3, and the two fins B, C, are made flat. The crooked handle ABC, Fig. 4, fhould be triangular, and fomewhat fharp before, to anfwer the end of a coulter, as in Fig. 2, and 5.

"This fhare is to be let into a grove cut in the under part of the beam, as reprefented in Fig. 7, and 8; and faftened there by a fingle ferrule, as in Fig. 9. If it fhould cut too deep, that may be remedied by altering the pofition of the wheel, as in the plough, or by inferting a very fmall wedge *g*, Fig. 10, between the handle of the fhare and the beam. If it does not cut deep enough, that wedge muft be inferted, as at *h*, Fig. 11, at the other end of the handle.

"When this inftrument is ufed, the beam before defcribed is to be fubftituted in the place of that of the plough, which is to be taken off. The two crofs ftaves I, L, Fig. 1, of the fore-carriage of the plough, are then run through the mortifes G, H, of this beam, which is thereby fixed to that fore-carriage.

" This cultivator is very eaſily guided: the ploughman may hold it upright, or incline it to the right or left, juſt as the intended ploughing may require. The ſhare and its handle enter ſo deep into the earth, as to be quite buried in it, if a deep ploughing is intended to be given: and in that caſe the tail A of the beam touches the ground. Though the ſhare is but ſmall, it ſtirs the earth at leaſt a foot around it: its point ſhould be of ſteel, and ſomewhat inclined towards the earth.

" The ſhare of this inſtrument, like that of the plough, may be brought as near as one pleaſes to the rows of corn, by placing the beam accordingly in the frame."

Deſcription of M. de Chateauvieux's *double* CULTIVATOR.

" This inſtrument, Plate VII. Fig. 12, 13, and 14, has two ſhares. It has a beam AB, and the ſhares CD, EF, Fig. 13, which being exactly like that of the ſingle cultivator, I have only to point out wherein theſe inſtruments differ. The beam of this ſhould be ten or twelve inches longer than that of the other. It has likewiſe two mortiſes more, under the letters G and H, to let through the croſs ſtaves EK, IL, which bear the handles MN, OP of the ſhares. The croſs ſtaves EK, IL, are rivetted permanently to the beam: the handles MN, OP, are moveable upon the croſs ſtaves, to which they are faſtened by the keys R, S, Q, T; ſo that the ſhares may be ſet at a greater or leſs diſtance from each other, according as the quality or ſituation of the ground may require or allow.

" This inſtrument ſtirs the earth extremely well, and does a great deal of work in a little time. Each ſhare being about fifteen inches wide at AC, BD, Fig. 14, and the diſtance between them from A to B, Fig. 14, being about four inches, or, upon occaſion, ſix; and the earth being ſtirred about two inches on each ſide beyond the extent of the outmoſt fins of the ſhares; each cut of this cultivator ſtirs about two feet breadth of ground. This double cultivator requires two horſes, unleſs the ſoil be very light; in which caſe, I fancy one may do, though I have not yet tried it.

" If one had a mind to fix a coulter in the middle of the beam, juſt before the ſhares, I ſee no inconveniency that could ariſe from thence, provided it be a very light one.

" The way to uſe this cultivator, is, to faſten it to the fore-carriage of the plough, by running the two croſs ſtaves V, X, Fig. 13, through the beam A, B.

" I would particularly recommend, not to make the wood work of this cultivator too thick or heavy, and therefore by no means to exceed the dimenſions I have given: for the lighter theſe inſtruments are, the more eaſily they are managed both by men and cattle."

Deſcription of M. de Chateauvieux's CULTIVATOR, *with two Mould-Boards.*

" If, ſays M. de Chateauvieux, I could have imagined, that my propoſing for the uſe of the new huſbandry, ſome other inſtruments beſides the plough, properly called, could have been looked upon as either ſo expenſive or ſo troubleſome as to diſcourage people from practiſing that huſbandry; I ſhould not, by any means, have thought of communicating them to the public.

" But why ſhould not agriculture enjoy the ſame advantages as almoſt all great manufactories, in which every uſeful diſcovery and improvement, either to perfect the manufacture, or to fabricate it in leſs time and with leſs expence, is readily adopted?

" It is with a view to facilitate the various labours of cultivation, to execute them better, more ſpeedily, and with much leſs expence, that I have introduced the uſe of my new inſtruments in the culture of my own lands. If others think proper to do ſo too, they will enjoy the ſame advantages. I offer them, not as things abſolutely neceſſary, for the plough alone may ſuffice; but as things of which I have experienced the good effects during the years 1753 and 1754; and which, for that reaſon, I think it incumbent on me to recommend to thoſe who adopt the new huſbandry.

" The cultivator with two mould-boards differs from the ſingle cultivator before deſcribed, only in the two mould-boards which I have added to it, one on each ſide, and which are repreſented in Plate VII. Fig. 15. A, C, E, H, is the mould-board on the left-hand ſide of the plough; and B, D, G, H, the mould-board on the right-hand ſide. The whole of this Fig. 15, repreſents an entire and a perſpective view of the ſhare and mould-boards.

" The mould-boards are made of plates of iron, either caſt or hammered, about the twelfth part of an inch thick; which is ſufficient to reſiſt the preſſure of the earth. Thicker plates than theſe would render the ſhare too heavy, and it would be much more difficult to give them their proper bent.

" The two mould-boards join to the handle at HL, and lap about an inch one over the other; or elſe they are faſtened together by rivets. They form, in that part, an angle E, H, F, of ſomewhat leſs than ninety degrees, which is ſufficiently acute to ſerve inſtead of a coulter: though a coulter may alſo be uſed upon occaſion, by placing it a little more forward.

" From the lower part L of the handle, the mould-board ſhould paſs underneath the fin L, G, of the ſingle ſhare, and follow the direction of that fin, as at G; being let in beneath, about an inch and an half, according to the pointed line LG, and firmly riveted by three ſtrong rivets.

" The hind part of the mould-boards is fixed and ſupported by the ſtay F, to which they are ſtrongly riveted. This ſtay muſt have exactly the ſame bend as the mould-board.

" Behind the lower part of the handle is another ſtay, M, N, quite cloſe to it, and about two inches below the top of the mould-boards, to which it is riveted at both ends. This ſtay helps to keep them firm: but its chief uſe is to prevent their being raiſed up by the preſſure of the earth againſt their extremities A and B, which would throw their common angle H too forward, and miſplace the ſhare.

" The proper ſlope of the mould-boards cannot be ſo well deſcribed by words, as it may be conceived by the figure, which repreſents at F the convex inſide of the one, and at Q the concave outſide of the other. The diſtance to which the earth is turned over, when the cultivator opens it in order to make a large furrow, depends on the degree of this bending, and the ſpace between the two upper extremities of the mould-boards E, F.

" The hind-moſt part of the mould-boards is cut ſloping at C and D, almoſt in a ſegment of a circle. This ſhape helps to effect a greater diviſion of the earth.

" The plate of iron, before it is bent, ſhould be cut nearly in the ſhape of Fig. 16.

" The ſize of the mould-boards, as well as their proper bending, depends a little upon the quality of the land intended to be cultivated. I have found that, for light ſoils, they need not be bent quite ſo much: ſo that the diſtance from C to D, Fig. 15, may be twelve or thirteen, and even fifteen or ſixteen inches. This ſame cultivator may likewiſe be uſed in ſtiff lands.

" Nothing hinders making theſe mould-boards two or three inches longer, from B to G, and from E to H; or varying ſome of their proportions, as the huſbandman may think beſt.

" This ſhare, with the mould-boards, is fixed to a beam, as in the ſingle cultivator, Fig. 1, where it is faſtened to the fore-carriage by the croſs ſtaves I, L.

" If this deſcription does but convey a ſufficient clear idea of the ſhape and proportions of this cultivator, I will anſwer for its ſucceſs when uſed. I deſcribe it after one of the ſame kind, which I have made uſe of for two years paſt, with very great ſucceſs."

Direction for uſing the CULTIVATOR, *with two Mould-Boards, by M. de* Chateauvieux.

" This cultivator opens the main furrow in the middle of the alley, by turning the earth over on both ſides at the ſame time; and I have found by experience, that as much work is done by that means, by one turn of this inſtrument, as could be done by two, and frequently

quently three turns of the common plough, and that without ufing a greater number of cattle. I muft now prove this propofition; though I am perfuaded that it will eafily be allowed by whoever only cafts any eye upon Fig. 15, Plate VII. which reprefents the fhare of this cultivator." *See the article* ALLEY.

Defcription of a CULTIVATOR *invented by M. de* Villiers.

"This inftrument is compofed of a fhare, Plate VII. Fig. 17, the two fins of which are eight inches and a half afunder at their extremities *a*, *b*. The focket *c*, which is between the two fins, projects fome inches, and the hollow in it is three inches long, and one inch wide. It does not defcend fo low down as the fins, to prevent its touching the earth. The length of this fhare, from the point *d*, to the extremity of the fins *a* or *b*, is from 12 to 13 inches. At the diftance of five inches from the point *d*, is a hole *e*, into which is inferted the crooked point *f*, of the iron fafeguard, Fig. 18, which is ufed in fome countries in order to faften the ear to the fhare of the plough. Upon the fhare is placed a fmall triangular ear *h*, Fig. 20, 21, and 22; fomewhat concave at bottom, that the two fmall ears may join exactly to the fhare at about an inch diftance from the edge of the fins. This ear is about two inches and a half high at *a*, Fig. 21, and is faftened firmly to the fhare by a double and angular fafeguard, which covers its edge as far as *b*. It is fixed at one end by its point, which enters into the hole *e*, Fig. 17, in the fhare, and by four fmall pins faftened to the ear. Fig. 18 and 19, reprefent this fafeguard. The double ear is faftened at its other extremity, by the fheat or upright piece, *e*, *g*, Fig. 21, which paffes through the ground-reft of the hinder part of the ear and beam, and by a piece of iron *c d* bent in a right angle. This piece of iron covers the fore-part of the fheat, and refts upon the tail of the ear, againft which the beam preffes it very tight, by means of a wedge *e*, driven into the fheat. The piece *c d* may likewife ferve to fix two mould-boards from *g* to *c*. It is nine inches high. *f* is another fheat or upright piece, which joins the beam to the ground-reft, to add to the ftrength and folidity of the inftrument, which is increafed alfo by the lower part of the handles being fixed in the ground-reft at *i*, and traverfed by the beam at *k*."

M. de Villiers, in a letter to M. Duhamel gives the following account of his manner of ufing this cultivator.

"Finding it impoffible to plough my alleys well when they were but three feet or three feet and a half wide, without greatly damaging the rows of corn bordering upon them; I refolved to make them four feet wide, and took particular care to have the rows drilled very ftrait: but even then I found only one way of ploughing them well, which is, to open the firft furrow fo near to the bed, that the next furrow within that may come within two or three inches of the neareft row of plants in the bed; turning over the earth of thefe furrows towards the alley. After two or three fuch turns of the plough, the ploughman will be fure not to make any miftake. It is of great importance to cut this firft furrow, by which all the others are directed, quite parallel to the rows. The reft of the work will then go on regularly, and without any of that confufion which would be capable of giving many people a diflike to the new hufbandry. My horfes were led by hand, till they were fufficiently accuftomed to this work: but that was neceffary only for the firft furrow, which they afterwards follow of their own accord, fo that the reft of the alley is ploughed with great eafe.

"The earth of the fecond furrow, which is cut very near to the rows, is turned over in the fame direction as that of the firft; that is to fay, from the bed.

"The third furrow is ploughed the contrary way, and the earth is then turned over towards the rows, fo that the laft furrow is filled up by this ploughing, and a confiderable quantity of well divided earth is turned over to the rows, for the plants to extend their roots in the fpring.

"I then continue ploughing in the fame direction, cutting the furrow that is turned over towards the rows as thick as poffible, till the whole alley is ploughed almoft clofe to the oppofite bed, when, by turning over one large furrow on that fide, the fmall one cut there at firft is filled up. By this means, the firft fpring hoeing is completely executed.

"I begin the fecond ploughing on the fide where I ended the firft, turning the earth over that way, which is the contrary to what was done before: and when I come to the other fide of the alley, I leave there, as was left before on the fide I now begin at, the breadth of a fmall furrow, which I do not plough, but over which I turn the earth of my laft furrow.

"I think this fecond hoeing may be deferred, when the ground does not produce many weeds: and in this cafe I perform it with the cultivator, which I bring almoft clofe to the rows.

"After thus ufing, fometimes the plough, and fometimes the cultivator, according as the condition of the ground feems to require, I finifh all my hoeings by putting two horfes to the cultivator, and drawing it once or twice through the middle of the alleys; becaufe it cuts four or five inches deeper than the plough."

M. de Villiers adds, that he could not always turn the earth over towards the rows, as M. Duhamel directs, becaufe the wheel of his plough, getting too deep in the middle furrow, altered the direction of the fhare. To this M. Duhamel obferves, that he himfelf met with the fame difficulty, and found no other way of remedying it, but by opening a fmall furrow near the rows, by the help of which he turned the earth over towards the alleys, and then filled up that furrow immediately; taking care at the fame time to turn the mould over towards the roots of the plants, fo as to earth them up as much poffible. "I am glad, adds he, that I have had this opportunity of giving M. de Villiers's method, becaufe I think it a good one, and believe it will be of great fervice to fuch as may be inclined to practice the new hufbandry." *Duhamel's Cultures des Terres, tom.* I.

CULTUR, or rather *Coulter*, the piece of iron that cuts the earth before the plough-fhare. *See the article* PLOUGH.

CULTURE, the art of cultivating, improving, or meliorating the foil.

CULVER, a pigeon.

CURB, an iron chain faftened to the upper part of the branches of the bridle, in a part called the eye, and running over the beard of the horfe.

CURB, is alfo the name of a difeafe in horfes, confifting in a fwelling at the junctures of the bones on the hind part of the hock, forming a pretty large tumour over the back part of the hind leg, attended with ftiffnefs, and fometimes with pain and lamenefs.

A curb proceeds from hard riding, ftrains, blows, or kicks. The cure at firft is in general eafily enough effected by bliftering repeated two or three times, or even oftener. If it does not fubmit to this treatment, but grows exceffively hard, the quickeft and fureft way is to fire with a thin iron, making a line down the middle from top to bottom, and drawing feveral lines in a penny form manner pretty deep; and then to apply a mild bliftering plafter or ointment over it. This method will entirely remove it. *Bartlet's Farriery, p.* 262.

CURRANT-TREE, the name of a fhrub well known in the Englifh gardens, and of which there are feveral varieties; but the moft valuable forts, for common ufes, are the white and red Dutch.

Thefe forts may be eafily propagated by planting their cuttings any time from the middle of September to the end of October, upon a fpot of frefh earth, either in rows, at a foot afunder, or in beds, which in the fpring muft be kept very clear from weeds. Thefe may remain one or two years in the nurfery, during which time they muft be pruned up for the purpofes they are defigned for; that is, either to clear ftems about a foot high, if for ftandards; or, if for walls, pales, or efpaliers, they may be trained up flat. They fhould then be planted out where they are to remain, for the younger they are planted,

planted, the better they will succeed; the best season for which is when their leaves begin to decay, that they may take root before winter, so that they may be in no danger of suffering from drought in the spring.

These shrubs are generally planted in rows at about ten feet asunder, and at four distance in the rows, in those gardens where the fruit is cultivated for sale; but the best method is to train them against low espaliers, in which manner they will take up much less room in a garden, and their fruit will be much fairer.

The distance they should be placed for an espalier, ought not to be less than ten or twelve feet, that their branches may be trained horizontally, which is of great importance to their bearing.

Those that are planted against pales or walls, should also be allowed the same distance. If they are planted against a south-east wall or pale, it will cause their fruit to ripen at least a fortnight or three weeks sooner than those in the open air; and those which are planted against a north wall or pale, will be proportionally later; so that, by this method, the fruit may be continued a long time in perfection, especially if those against the north pales are matted in the heat of the day.

These plants produce their fruit upon the former year's wood, and also upon small snags which come out of the old wood; so that in pruning them, these snags should be preserved, and the young shoots shortened in proportion to their strength. The only method, very necessary to be observed in pruning them, is not to lay their shoots too close, and never to prune their snags to make them smooth. This, with a little care in observing the manner of their growth, will be sufficient to instruct any person how to manage this shrub, so as to produce great quantities of fruit.

These plants will thrive and produce fruit in almost any soil or situation, and are often planted under the shade of trees: but the fruit is always best when they are planted in the open air, and upon a light loamy soil. *Miller's Gard. Dict.*

The juice of the currant pressed out, mixed with a proper quantity of sugar, and duly fermented, makes an excellent wine, which is very comfortable to the stomach and nerves.

CURRY-COMB, an iron instrument full of small teeth, used for currying horses.

CURSONS, spurs, or snags, growing on the stems and branches of the apple, currant, and other fruit-trees.

CUSPATED *flowers*, those whose petals or flower-leaves end in a point.

CUTTING-BOX, a machine for cutting fodder, as straw, hay, haulm, &c. into small pieces, commonly called chaff, for the use of cattle.

We have given on Plate VI. Fig. 11. a cut taken from the Museum Rusticum, vol. VI. page 10, of an improved cutting-box. The improvement consists in what the inventor calls a presser, which is a piece of wood as long as the box is wide, with three iron tongues in it, like those of a hay-fork. These tongues are put into the bundle of hay or straw to be cut; and by means of a rope fixed thereto, and extending under the box, the presser is forced down by the left-foot of the cutter, and consequently the bundle kept tight. By this means the chaff is cut with great ease; and after every cut, the operator rises his left-foot, pushes his sheaf or bundle forward with his left-hand, then presses it down again with his foot, and takes another cut. In this manner he continues working, till the whole bundle is reduced to chaff.

This description will be very easily understood by inspecting the figure above referred to, where A is the presser, B a large knot at the end of the rope, which fastens it to the presser. C the rope, DF, the slit in which the rope moves, as the cutter pushes the bundle forward. E the loop in which the cutter puts his left-foot. F the box to contain the hay, straw, &c. The knife is not delineated in this figure, as the manner of placing it is sufficiently known.

A correspondent of the editors of the Museum Rusticum tells us, that he never gives his horses any pure corn, but always makes use of his cutting-box, in which his servants cuts his horse-meat, which consists of unthrashed oats, tares, pease, or beans. They cut off the heads where the corn lies, and take besides a cut or two of the straw to mix with it. This he gives to his horses instead of corn: it being a very nourishing food, and of which they are very fond. Nor is there any danger of their being surfeited with it, which they often are with pure corn; many of their disorders arising from their being over-fed.

"I cannot, continues he, enough commend the use of a cutting-box, though I am persuaded the ploughmen will endeavour to prepossess their masters against it, because the cutting of the horse-meat is pretty tough work, and they do not, in general, love to do more than they can help.

"When oats, beans, pease, or tares, are intended to be thus cut for horse-meat, it is best to mow them before they are quite ripe, as by that means fewer of them will be lost by shaling, and the straw, or stalks, will be of a better quality, and more nourishing for the cattle.

"Care must, however, be taken that the crop be well dried before it is housed, lest it heat in the mow, and take damage, if not set the barn, or stack, on fire." *Museum Rusticum, vol.* I. *p.* 258.

CYDER, or *Cider*, a liquor made from the juice of apples, expressed and fermented.

A Herefordshire planter has given us the following method of making cider in that county, which has been so long famous for this liquor.

"The worse, says he, the apple is for the table, the better it is, in general, esteemed for cider, such as grow all over this county, and are, in a manner, wild, harsh, and crabbed to the taste. These go under various names, as the redstreak, the white and green musts, the gennet-moyl, the stocking apple, the summer and witer fillets, &c. &c. of all which I prefer the first, provided it is a good sort, which is not always the case, particularly in some parts of Worcester and Gloucestershire, where they grow in great plenty.

"I have long laid down from experience, the best mistress, that, first, the more red an apple has in its rind, the fitter it is for cider; that is to say, if it is at all fit; for I have seen an apple of very deep red, by some called sopsy-wine, quasi sopped in wine, which was worth nothing in this intention.

"Secondly, That the paler the rind, the worse the juice.

"Thirdly, I have found it a maxim in general true, that a sweet apple with a tough rind will always yield a good vinous liquor.

"Fourthly, The more yellow the flesh of the fruit, the better and finer coloured will the cider be.

"These few maxims, not too scrupulously adhered to, have been of great service to me in life; for though I have a high opinion of them, I do not absolutely rely on them. There is no rule so general, but an exception may be made to it; but a man of reflection, with a few well-founded rules, will seldom be at a loss how to act in this, or in any other case.

"I seldom suffer my apples to be gathered till they begin of themselves to drop from the trees: nature then tells me they have, for the most part, acquired a proper degree of maturity.

"Great care is taken in the gathering of them, for fear they should be bruised in the operation; and this I have always found a very necessary precaution.

"As they are gathered I have them sorted, according to the several degrees of ripeness they are of, making, in general, three sorts, which a little experience easily teaches to separate properly, the difference being apparent enough at first sight.

"As fast as they are gathered and sorted, they are carried under a shed prepared for the purpose, and laid in large heaps to meliorate: this practice I cannot enough recommend, as being of great service to the liquor, improving its quality, and making it keep, without comparison, better; and all this is caused by a little sweating in the heap.

"Yet

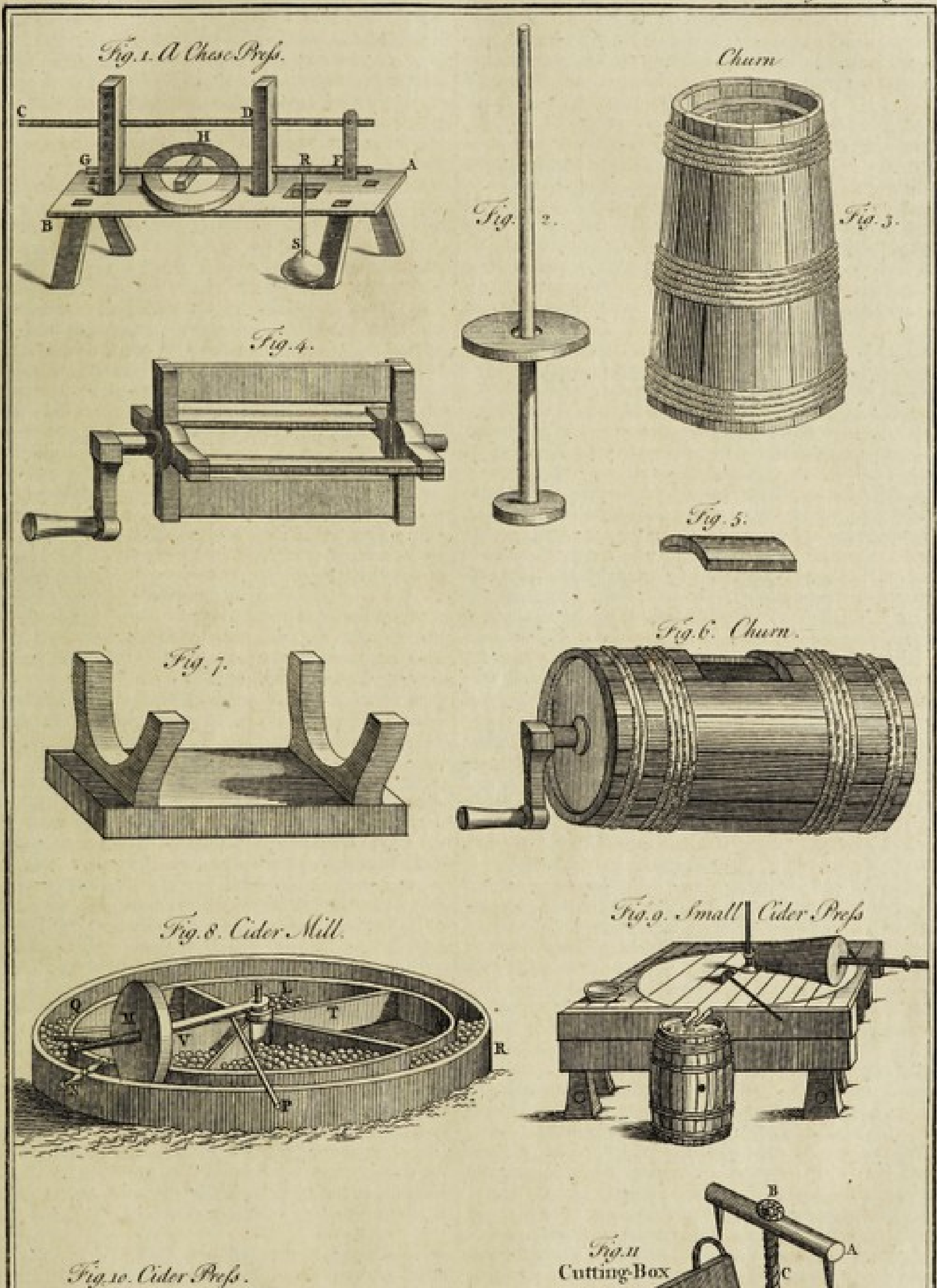


Fig. 1. A Chese Press.
C
D
H
G
R
F
A
B
S
Fig. 2.
Churn
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 7.
Fig. 6. Churn.
Fig. 8. Cider Mill.
Q
M
L
T
V
R
P
Fig. 9. Small Cider Press
Fig. 10. Cider Press.
D
C
C
B
A
A
H
Fig. 11
Cutting-Box
B
A
C
D
E
J. Hulett sculp.

"Yet, good as this practice may be, fome avaricious planters cannot be induced to adopt it, becaufe, fay they, the apples frefh from the tree will yield better; as, of thefe laft, about twenty bufhels will give a hogfhead of cyder; whereas, of the other apples, which have been heaped, it will take about twenty-five to make the fame quantity.

"I fuffer my apples to lie in the heap a longer or a fhorter time, according to the nature of them, fuch as are harfh and folid requiring to lie longer, by feveral days, than thofe that are mellow and pulpy; and the degree of maturity the apples had attained before they were heaped, makes alfo fome difference in this refpect.

"I have already obferved, that I divide my fruit into three feveral forts, according to the ftate of its maturity: I have now to add, that from thefe three fortings I have no lefs than fix feveral kinds of cyder, each different from the other in tafte, flavour, and quality.

"As faft as the fruit is ground (I need not, I think, mention that I ufe the ripeft firft) the pulp is put into a large vat near the prefs: at the bottom of the vat is a tap, through which a confiderable quantity of the prime vinous juice will run without any preffing, induced by its own weight only: this produces my beft cyder; and I always tun it up by itfelf: the pulp is afterwards preffed in the ufual way. The fame procefs is ufed in all the three fortings of apples; by which means I get, as I faid before, fix forts of cyder.

"The firft runnings from the vat I immediately put into the veffels in which it is to remain; only, if it happens, by any accident, to be too foul, I ftrain it firft. I allow here but a fmall vent-hole, and when it has done working, I fill the veffel with fome of the fame liquor referved for that purpofe: I afterwards, by degrees, clofe the vent till it is finally and well ftopped.

"As to the juice, which undergoes the action of the prefs, I put this, as foon as it runs off, into veffels, where I fuffer it to remain about thirty hours, according to the feafon, till the *fæces* are precipitated, or fallen to the bottom; after which I draw it off, and tun it up in the veffels in which it is to remain, with the precautions, however, above-mentioned, when I treated of the firft runnings.

"The kind of veffels I ufe, and which I think by far beft, are upright hogfheads, broader at the upper head than at the bottom; and I often, after my cyder has done fermenting, caft two or three handfuls of wheat-bran into each veffel, which ferves to thicken the head or cream of the liquor, and makes it keep better.

"I am very careful with refpect to the veffels into which I put my cyder, always avoiding new ones, if poffible, as they give the liquor a twang, or bad tafte, and hurt its colour: my ufual way is, to feafon all my new cafks, that I poffibly can, with fmall beer, which I ufe in common in my family, though I live in a cyder country; and if I have not an opportunity of doing this, I fcald them with water, in which a confiderable quantity of apple-pulp has been boiled.

"If a veffel is not fweet, it may eafily be cured, unlefs very bad indeed, by putting fome unflaked lime into it, adding fome cold water, ftopping it clofe, and rolling it about till the noife within is no longer heard.

"I have often found it of great ufe towards enlivening the liquor, to flice about a dozen fweet apples into a hogfhead: I am alfo inclined to think it makes it keep better.

"The beft cyder I ever had was a few years ago, when I put in each hogfhead about three quarts of good wheat firft boiled and hulled, fo as to have, in fome meafure, the appearance of boiled rice.

"When I am obliged to put any cyder into a cafk I fufpect, and afterwards difcover it has given the liquor a bad tafte, I caufe fome muftard feed to be ground in a quern with fome cyder: this mixture, being put into the hogfhead, is often of great fervice, and reftores it to its original good tafte.

"Cyder, when it is tunned, is very apt to lofe that fine mild fpirit which renders it fo pleafant and brifk a liquor; therefore great caution fhould be ufed with refpect to the vent. The wild, furious, and ungovernable fpirit fhould be fuffered to efcape; which may eafily be effected, by leaving a fmall vent open for a few days; after which the barrel muft be clofe ftopped, for if it gets any vent, the liquor will ftand a great chance of being entirely fpoiled; on the contrary, if well bunged, though it may be dead and flat at firft, it will foon recover itfelf, maturate, and be fit for drinking. This particular part of the management of cyder is critical, and depends greatly on the temperature of the air, fo that it is impoffible to give any abfolute directions about it, as fomething muft ftill be left to be learned by experience, and governed by difcretion.

"I muft give one particular piece of advice to fuch as intend making cyder, which is, that they diligently watch the alterations in it upon every change of weather, as a fmall neglect, at fuch times, is often fatal to many hogfheads, and the danger is much greater in fummer than in winter. There is fcarcely any difeafe incident to this liquor, but what may eafily be cured by a timely application: if it is only a little inclined to tartnefs, wheat, managed as above-mentioned, will cure it; and the fame thing is alfo very good to preferve it, when it is drawn out of one cafk into another: the quantity when the liquor is tart is about half a peck to a hogfhead; I have fometimes even put a quart more.

"This fimple remedy will, I fay, often cure the tartnefs I mentioned; but fometimes, when it is very thick and fourifh, it may be neceffary to raife a new fermentation, to purge off the impurities, and make them fubfide: this may be foon done by bruifing the flefh of a few apples to a pulp with fome of the liquor, and putting the whole into the bung-hole of the veffel; this will raife a ferment, and cure the cyder: when that is over, it will be proper to draw it off into another cafk; and it will alfo be a very ufeful precaution, to put into the laft mentioned veffel about a quarter of a peck of wheat, prepared as I have already directed: this will give it new life and fpirits, and make it keep better, and drink much pleafanter.

"I have fometimes alfo ufed another method to cure tart cyder; but it has not always fucceeded with me; why, I cannot fay, as fome people, who live not many miles from me, have great dependence on it. Something may depend on their foil differing from mine, though this may, to fome of your readers, feem to have a very remote analogy to the cafe in hand. The remedy is, to break half a dozen new-laid eggs, and beat them up, fhells and all, till they are brought to a frothy oil: this is put into the bung-hole of a hogfhead, and, as I am credibly informed, fometimes proves a very efficacious remedy: it has fucceeded with me, but not fo often as to induce me to depend much upon it; I mention it, however, as it may prove of more efficacy with others than it has with me.

"An induftrious planter will, by the conftancy of his obfervations and remarks, always have it in his power to cure his own liquor by receipts of his own difcovering; and for this purpofe I would recommend, that he be continually making experiments, and that whatever trials he makes, be in various modes and proportions; for the remedy that may be of no fervice in one form, may poffibly be very efficacious when altered with judgment, which judgment can only be acquired by experience and obfervation.

"It is to be noticed, that, if the cyder is acid, and at the fame time clear, it is in a very dangerous ftate, being but rarely recovered: therefore, in general, when this is the cafe, the cure is fcarcely worth attempting.

"I have often ufed wheat for the recovery of my cyder in other forms, fometimes putting about half a peck, unground, into a hogfhead for it to feed on; at other times I have made dough of coarfe meal with the bran in it, adding fome leaven, ufing no falt, and putting warm cyder, or white wine, inftead of water, in the mixture: this dough I make into lumps about as large as my fift, and thruft them into the bung-hole of the hogfhead, the quantity being about half a peck of the meal to a hogfhead.

"Many mix different kinds of fpice with their liquor, particularly ginger, which they think of great fervice; but I never ufe it now, feldom having found any great effect refulting from it, and being of opinion that it renders

ders the cyder more unwholesome than it can possibly in its own nature be; for, though the ginger may not make any very sensible alteration in the immediate taste of the liquor, it must, I think, strongly impregnate it with its fiery particles, and thereby greatly irritate the mass of blood, and inflame the lungs of such as drink any quantities of liquor wherein it has been infused: others, however, may differ in opinion from me: I know, indeed, many that do so; therefore I only declare my opinion." *Museum Rusticum, vol.* II. *p.* 37.

It is of great importance in the making of cyder, that the fruit be thoroughly ripe. The juices of unripe apples retain their harsh, sour taste, in spite of all endeavours, and never acquire that racy, mellow flavour, which the sun only can bestow. Sweating together in a heap will, indeed, give them an artificial ripeness; but this is not equivalent for that which they receive from nature, which though it receives some assistance from the industry of man, can never be completely imitated by art.

It should, therefore, be the first care of every one concerned in the making of cyder, to let his apples hang upon the tree till they arrive at full maturity. But no certain time can be assigned for this: it varies with the nature of the fruit, and the circumstances of the season. Different apples have different times of ripening; and the same, according to the weather, change their times considerably from one year to another: but signs there always are sufficient to direct the husbandman. The brownness of the kernels, their rattling in the apple, the fragrant smell of the fruit itself, and its spontaneously falling from the tree in calm weather, are certain indications, which, in all kinds, may be depended on. It is, however, an useful caution in this, as in every other case, to err on the right-side, and to let the apples hang too long, rather than too little. Summer fruit, indeed, will suffer by this method, grow pulpy, dry, and mealy, and afford little or no juice. In every other case the rule is good, and in the best fruits, most. The harsher kinds can hardly hang too long, for they daily mend upon the tree: their juices mellow, throw off their crude and watery parts, and consequently, as the crude juices lessen in quantity, the apples improve proportionably in quality. They may hang upon the tree as long as the weather can be expected to continue open: but severe frost should be most carefully avoided, because it destroys the texture of the fruit so much, that even cold water, the only remedy in such cases, will not restore it to its former state: for as all fluids enlarge their dimensions when frozen, the containing vessels of all succulent substances must be thereby burst, and this has upon the fruit an effect similar to a bruise, or any other cause that destroys the vessels, whereby the extravasated liquors soon putrify. From this cause it is that the strongest forest trees are often rent asunder in very severe frosts.

When your apples are fit for gathering, it is essential to choose dry weather for that purpose: for water is a bad ingredient in all vinous liquors, and your fruit should therefore be guarded from it with peculiar care. The wet which adheres to the apples after rain or dew, or even the smaller quantity of moisture which they might contract by falling or lying upon grass, is sufficient to impoverish your cyder in a sensible degree. Gather your fruit therefore in the driest day, and in the driest part of it, when the dew is thoroughly exhaled, and, of choice, gather it by hand. This method may, perhaps, be troublesome and difficult in plantations of great extent, and where the trees are very tall: but wherever it can be used it is of great advantage, and certainly quits cost. You then can choose your apples, and leave upon the tree those which are not of a sufficient ripeness: you save your fruit from bruises, and your trees from the damage they frequently receive by violent unskilful shaking.

The gathering by hand is so essential, especially for winter fruit, which is to be sweated for a considerable time, that it should not by any means be dispensed with; because, as every wounded part of an apple will rot in the sweating, a very great loss must be occasioned, both in the quantity of the fruit, and in the longer time taken up in wiping and rubbing off every speck of rottenness upon each single apple. This last labour is indispensible; because, otherwise, the putrid taint would ever remain in the liquor. Those who plead the want of time, where a great quantity of fruit is to be pressed, may be answered, that it would be more to their advantage to have only half the quantity of good cyder, than the whole of indifferent; and the gathering may certainly be expeditiously performed by means of step-ladders. The apples may be put into baskets, as they are gathered, and thereby be preserved free from hurt, and the tree will not be injured as the support of the ladders here recommended is independant of the tree. However, for those who will follow the contrary practice, the best method is, to cover the ground under the trees with a sufficient thickness of straw to save the apples in their fall, and to lay blankets upon the straw; then, with an easy motion, to shake the boughs successively, removing, at every shaking, the apples already fallen, that they may not be bruised by the next. By these means all your apples are kept dry, and, for the most part, free from bruises; and with a little additional care you may also, in this method, separate the fruits according to their ripeness: for if you proceed regularly from bough to bough, and give each a gentle swing, the ripest will fall first, and the unripe remain upon the tree till more violent motion brings them down.

Windfalls, as they are generally termed, bruised, apples, and those which have not been well ripened, should not by any means be mixed with the choice fruit; for if they are, it would be in vain to expect good cyder: the quantity of it may indeed be large, but it will always be proportionably bad. This fruit need not, however, be thrown away, excepting only that part of it where the bruise appears black and mouldy; for a very little of this would communicate an offensive taste to the whole liquor. The rest will make inferior kinds of cyder; and if care be taken that the windfalls do not lie too long upon the ground, and if keeping cyder be not expected from bruised apples, they will answer tolerably well: nay, Mr. Newburg tells us, in a letter subjoined to Mr. Evelyn's Pomona, that a neighbour of his assured him he had made a quantity of very good cyder with windfalls, which he ripened by sweating them for about a month, that they were beaten off the tree earlier than the season when nature would otherwise have compleated their maturity; but that all the neighbours of this person, who pressed their untimely fruit as soon as it fell, had a crude, austere, indigested liquor, not worth the name of cyder.

The sweating of the apples has, however, been made a matter of some dispute. The writer of the 24th letter in the Dublin Society's weekly observations disapproves of it for choice ripe fruit, and instances his having been informed of some curious gentlemen who carried their thoroughly ripe apples directly from the tree to the grinding mill, without any previous sweating, and obtained from them some of the best cyder they ever tasted. As to the winter fruits, he thinks it probable that the necessity of sweating them might be removed, by leaving them upon the trees, somewhat longer than is necessary to ripen them; "no reason," (says he, without having perhaps sufficiently attended to the benefit which fruit receives from being discharged of its watery parts,) "hitherto appearing to make us think that this fermentation by sweating serves any other use than to increase the degree of maturity which the fruit had acquired upon the tree.—It is indeed possible," continues he, "that it may answer farther purposes, and dispose the fruit to an easier emission of its juices: and as our reasonings upon nature frequently lose their way, where experience does not guide them, it is from trials only that we can form a judgment to be depended on: recourse must therefore be had to actual experiments, which in this case are easy, and will certainly quit cost: for which ever way the question be determined, something must be found very well worth the knowing. Should sweating answer some purpose not to be attained upon the tree, it will, when once discovered, ascertain the nature, the use, and the degree of sweating: or should nothing of this kind appear, it will correct a practice, which, if it does no good, must certainly do

mischief;

mischief: since it is evident to common sense, that if maturity be all that is wanting, it is more perfectly and more naturally attained upon the tree." However, till this is determined by experience, it will be right to continue the practice of sweating every apple: for as to windfalls, and other hard and unripe fruit, it is out of dispute, that as they are deprived of natural maturity, they must be assisted by art.

Upon the whole, there seems in this case, one rule which may be followed for all fruits; namely, to press their juice for fermenting at the time when the fruit itself is in the greatest perfection for eating. Experience teaches us, that there are few apples which do not require time for their being mellowed, before they attain to their highest flavour. The golden pepin, for example, is in its greatest perfection when kept till October; and in favourable years it will retain its flavour and juiciness even till Christmas, or longer. The nonpareil does not attain its chief excellence till near Christmas, and after that it continues in perfection several weeks. It is therefore during the time these apples continue in perfection, that they are fittest to be pressed for cyder; and the same will doubtless hold good of the other sorts, none of which should be pressed before they have attained their highest flavour, nor after they have begun to lose it. A principal advantage accruing from the sweating of apples is, that the fruit is thereby deprived of the watery parts of its juice, which would only weaken the liquor; while its pulp yields a greater quantity of the enriched juice after it has been mellowed.

The material points to be observed in the sweating of apples are, that the fruits be separated according to their different degrees of ripeness, and that the floor on which they are laid be as dry as possible. The more strictly the former of these cautions is observed, the better it will be; and the more the fruit in every heap is alike in its maturity, the sooner the sweating will be over, and the less damage will accrue to the ripest and best apples in the heap. However, if care be taken not to mix any that are very ripe with others that are very green, the injury will not be great: but if this should be neglected, as it too frequently is, either the ripe apples will rot, or the green ones will remain unmellowed; and in either of these cases, the cyder will be considerably lessened in its value. Boarded floors will best answer the intention of the second caution, because they are driest: earthen floors, however, if covered some inches deep with wheat, rye, or oat straw, will do tolerably well. It is likewise essential, for the better preservation of the apples, that they do not touch the walls or sides of the store-room in which they are laid to sweat. To heap them up in the orchard, or any where else upon the grass, or on an uncovered floor where the rains and dews have free access to them, is a sure way to make the cyder weak and watery, and frequently musty and ill-tasted.

Sweating being then undeniably necessary, at least for unripe, hard, and winter fruit, the husbandman, who makes a considerable quantity of cyder, will find a great conveniency in having near his orchard a building, of which his mill and press should occupy the lower floor, and his apples be sweated in that above, from whence they may be conveyed into the mill by a proper trunk. The duration of the time of sweating is best determined by the smell of the fruit; that is, whenever it emits a full scent of the apples, they are fit for the press. Different kinds require different lengths of time, viz. from eight or ten days, to six weeks. The harsher the apple is, the more time it wants.

Apples that have laid any time in heaps, are generally covered with a clammy moisture, proceeding from their sweating. This should be well wiped off; for it is a watery juice, which would impoverish the cyder; and at the same time every bruised and rotten part of the apple should be carefully cut out, and thrown away, and it should be cleared of its stalk; because the former would give a putrid taste, and the latter too much roughness, to the cyder.

The common practice is to carry immediately the apples from the heap where they have been sweated, to the mill, and then to grind them; but if we attend to the length of time during which they will remain in a succulent state after having been sweated, carefully wiped dry, and properly laid up in a place of preservation; we shall find, that, if these directions are duly observed, the fruit will continue in a perfectly sound state, and fit to be made into cyder, till it may be convenient for the husbandman to press it: but before he does this, or rather before he sweats his apples, he should take care to sort them, or at least all the most valuable kinds, and particularly the stire, under-leaf, fox-whelp, and golden pepin, which hitherto have not been found to do so well in mixtures, as each of them does by itself.

The juice of the apples is obtained either by pounding the fruit in a trough, or grinding it in a mill. The former of these is least approved, because it is so tedious as to suit only small quantities, and the work is performed by it unequally, and with waste; much of the liquor being dashed out of the trough by the beating, and some of the apples being hardly broken, when others are reduced to a perfect pomice.

There are several engines used for grinding the apples; but one in particular, resembling a tanner's mill, is used in many parts of England. It consists of a circular trough in which apples are bruised by a large flat stone moved round upon its edge. This engine we have represented on Plate VI. Fig. 8, where M is the stone set upon its edge; N, the spring-tree bar, or that to which the horse is fastened; P, Q, R, the circular trough in which the stone moves; T, L, V, compartments, or divisions for different sorts of apples.

When the apples are ground, some carry them directly to the press; but others empty them out of the trough into tubs, or large, wide, shallow vats. This work is done with most ease by broad wooden shovels: which should also be used to turn the pomice in the vats five or six times a day, to prevent any fermentation; the whole of this operation being chiefly intended to give the pomice a red colour, which afterwards heightens that of the cyder, and brings it to a deep, fine amber. This business is over in two days.

From these vats the pomice is carried directly to the presses, of which there are several kinds: we have given figures of two kinds on Plate VI. where Fig. 9. is the small cyder press, by which the juice is pressed out of the pomice by means of a stone, or block of heavy wood, cut in the form of the frustrum of a cone, and moveable about the center. The pomice is spread upon the bed of the press, where a conical presser is turned round by means of a lever inserted into its base, by which means the juice is forced out and conveyed by notches cut in the bed, to the vessel, by means of a spout, and represented in the figure.

Fig. 10, is a large cyder-press, where A B is the base with its supporters. C, C, the cheeks, which are upright beams, whose lower extremities are sunk in the earth, where they are firmly fixed by cross-bars and masonry. They are connected at the top by two beams, the lowermost of which contains the nut, or female screw. D, is the screw with its wheel; below which is the bearer, or large piece of timber on which the force of the screw is exerted, in order to sink the beams crossing the planks that cover the pomice or cheese, as it is then called. G, G, are the planks on which the pomice is disposed in hair bags, in order to be squeesed: these planks are cut in notches to conduct the liquor to a vessel properly placed to receive it. The bed of this press is supported on a massive work of masonry. It is the wheel which forces down the screw and bearer upon the pomice laid in hair bags upon the bed of the press. This is done by turning the wheel H round; for by that motion the cord is wound round its axis, and by that means the wheel fixed on the bottom of the screw is turned round, and the bearer together, with the cross planks under it, are forced down upon the pomice, laid in bags upon the bed.

These bags hold about two or three bushels, or as much as the mill can grind at once: and these are heaped over each other till the press is full. The larger presses will hold from eight to fifteen bags, which yield, from one to two hundred gallons of liquor, according to the largeness of the cheese. To perform the work neatly, it is necessary to have two sets of these bags; for they clog and fur in pressing, and, consequently, become unfit for use till they have been washed and dried; so that while this is

doing,

doing, either the prefs muft ftand ftill, or another fet be ready to employ it.

Some, inftead of hair-bags, lay long ftraw under the pomice, the ends of which they turn up over it; then cover the pomice entirely with frefh clean ftraw, upon which they fpread another layer of pomice, and fo on, alternately, till the prefs is full. Either of the above methods will do: but thofe who are defirous of doing the work in the neateft and beft manner, generally ufe the bags.

It is ufual to difpofe of all the liquor preffed out of the cheefes, the fame way, and without diftinction: but if the analogy holds, as it furely does, between cyder and other vinous liquors, this muft be a confiderable error. Experience has fufficiently fhewn, that in making wines, there is a very great difference between the firft yieldings of the grapes, and the juices which are afterwards extracted by hard preffings; and this difference is always in favour of the former; fo that, if the fame be true of cyder, the richeft, and choiceft kinds are loft, by an imprudent mixture of the whole.

It is an opinion generally received, and the writer of the letters in the Dublin Society's weekly obfervations, already mentioned, has adopted it; namely, that fummer fruit do not make good cyder. "Summer fruit, or fweet apples, fays he, afford only a weak, pert, windy juice, agreeable enough to the palate from its livelinefs and tartnefs, but in a great degree unwholfome. It has no body, and therefore will not keep, and fcarcely deferves the name of cyder." But Sir Paul Neile, whofe reafoning we fhall give in his own words, judged very differently.

"I affert, fays he, that the beft apples will make the pleafanteft, which in my opinion is the beft cyder; and I account thofe the beft apples, whofe juice is the pleafanteft at the time when firft preffed, before fermentation. I fhall need, befides the experience of the laft ten years, only to fay, that it is an undeniable thing in all wines, that the pleafanteft grapes make the richeft and pleafanteft wines, and that cyder is really but the wine of apples, and not only made by the fame way of compreffion, but, left to itfelf, hath the fame way of fermentation, and therefore muft be liable to the fame meafures in the choice of the materials.

"This truth was not formerly owned, by reafon that in Herefordfhire, and thofe countries where they abound with pepins and hard apples of all forts, they make cyder of both kinds, and ufed them alike; that is, that as foon as they had ground and preffed the apples and ftrained the liquor, they put it into their veffels, and there let it lie till it had worked, and afterwards was fettled again and fined; as not thinking it wholfome to drink till it had thus, as they call it, purged itfelf; and this was the frequent cuftom of moft men in the more fouthern and weftern parts of England alfo. Now, when cyder was thus managed, it is no wonder that when they came to broach it, they for the moft part found their pepin cider not fo pleafant as their moyle or redftreak cyder; but to them it feemed a wonder, becaufe they did not know the reafon of it, which I fhall next explain: for till they knew the reafon of this effect, they had no caufe but to think it was the nature of the feveral apples that produced it; and confequently to prefer the hard apple cyder, and to ufe the other apples, which were good to eat raw, for the table, for which the hard apples were totally improper.

"To fhew that, in Herefordfhire, they know not what was the true caufe why their pepin-cyder was not, as they ufed it, fo good as the cyder made of hard apples, I fay, that for all liquors which are vinous, the caufe that makes them fometimes harder or lefs pleafant to the tafte, than they were at the firft preffing, is the too much fermenting. If wine or cyder by any accidental caufe do ferment twice, it will be harder than if it had fermented but once; and if it ferment thrice, it is harder and worfe than if it had fermented but twice; and fo onward, the oftener it ferments, and the longer it ferments, it ftill grows the harder.

"According to the old method of making and putting up the cyder, they took little care to put up only the clear part of the liquor into their veffels or cafks. Now pepins being a fofter fruit, are in the mill bruifed into fmaller particles, than the harder forts of apples; and confequently more of thofe fmall parts pafs the ftrainer in the pepin cyder, than in the cyder of hard apples. This caufeth a ftronger fermentation, and, according to my former principle, a greater lofs of the native fweetnefs, than in the hard apple cyder; and not only fo, but the lee of the hard apple cyder being compounded of greater particles than the lee of the pepin cyder, every individual particle is in itfelf of a greater weight than the particles of the lee of the pepin cyder, and confequently lefs apt to rife upon fmall motions. When the fermentation of the hard apple cyder is once over, a fecond fermentation feldom happens, unlefs the veffels be ftirred: but in pepin cyder it is otherwife; for if the grofs lee be ftill remaining with the cyder, it need not the motion of the veffel to caufe a new fermentation; but every motion of the air, by a change of weather, will caufe a new fermentation, and confequently make it work till it hath deftroyed itfelf by lofing its native fweetnefs. This alone hath been the caufe why commonly when they broach their pepin cyder, they find it fo unpleafant.

"What firft gave me the hint of this, is that in divers parts they make three forts of wine out of one and the fame grapes; that is, they firft take the juice of the grapes without any more preffing than what comes from their own weight, and the bruifing they receive when put into the vat; which caufeth the ripeft of thefe grapes to break, and the juice, without any preffing at all, makes the pleafanteft and moft delicate wine. The fecond fort they prefs a little, which makes a wine neither fo pleafant as the firft, nor fo harfh as the laft, which is made by the utmoft preffing of the very fkins of the grapes, and is by much more harfh than either of the other two. Now I prefume the caufe of this, at leaft in part, to be, that in the firft fort of wine, which hath little of the fubftance, befides the very juice of the grape, there is little lee, and confequently little fermentation; and becaufe it doth not work long, it lofes but little of its original fweetnefs. The fecond fort, being a little more preffed, hath fomewhat more of the fubftance of the grape added to the juice, and therefore, having in it more of that part which caufes fermentation, ferments more ftrongly, and is therefore, when it hath done working, lefs pleafant than the firft fort, which worked lefs. For the fame reafon the third fort, being moft of all preffed, hath moft of the fubftance of the grape mingled with the liquor, and worketh the longeft: but at the end of the working, when it has fettled and is clear, it is much more harfh than either of the two firft forts. The thought of this made me firft apprehend, that the fubftance of the apple, mingled with the juice, was the caufe of fermentation, which is really nothing elfe but an endeavour of the liquor to free itfelf from thefe heterogeneous parts which are mixed with it: and when there is the greateft proportion of thofe diffimilar parts mingled with the liquor, the endeavour of nature muft be the ftronger, and take up the more time to perfect the feparation, which, when finifhed, leaves all the liquor clear, and the grofs parts, called the lee, fettled to the bottom of the veffel. Nor did this apprehenfion deceive me: for when I began to feparate a confiderable part of the lee from the cyder before it had fermented, I found it to retain a very great part of its original fweetnefs, more than it would have done if the lee had not been taken away before the fermentation; and this not once, but conftantly for feven years.

"The method which I ufed was this: when the cyder was firft ftrained, I put it into a great vat, and there let it ftand twenty-four hours at leaft, but fometimes more, if the apples were more ripe than ordinary: then, at a tap before prepared in the veffel, three or four inches from the bottom, I drew it into pails, and from thence filled the hogfhead, or leffer veffel, leaving the greateft part of the lee behind. During this time that the cyder ftood in the vat, I kept it as clofe covered with hair-cloths, or facks, as I could; that fo too much of the fpirits might not evaporate.

"Now possibly I might be asked why I did not, since I kept it so close in the vat, put it at first in the vessel: to which I answer, that had I put it at first into the vessel, it would possibly, especially if the weather had chanced to prove wet and warm, have begun to ferment before that time had been expired; and then there would have been no possibility to separate any part of the gross lee, before the fermentation had been wholly finished; which keeping it only covered with these cloths was not in danger: for, though I kept it warm in some degree, yet some of the spirits had still liberty to evaporate; which had it been in the hogshead with the bung only open, they would not so freely have done; but in the first twenty-four hours it would have begun to ferment, and so my design had been fully lost: for those spirits, if they had been too strongly reverberated into the liquor, would have caused a fermentation before I could have taken away any part of the gross lee. The great mystery of the whole lies in this; to let so many of the spirits evaporate, that the liquor shall not ferment before the gross lee be taken away; and yet to keep spirits enough to cause a fermentation when you would have it: for if you put it up as soon as it is strained, and do not let some of the spirits evaporate, but suffer the gross lee to be separated by its own weight only, without fermentation, it will ferment too much, and lose its sweetness; whilst on the other hand, if none be left, it will not ferment at all, and then the cyder will be dead, flat, and sour."

Experience taught Sir Paul, that it was necessary to delay the fermentation till late, or till the cold weather had come in, as he informs us, when he says, "It is necessary that the apples have a little time to sweat in the house before the cyder is made; but not too much: for if they be not full ripe before they are gathered, and not suffered to lie a while in the heap, the cyder will not be so pleasant; and if they be too ripe when they are gathered, or lie too long in the heap, it will be very difficult to separate the cyder from the gross lee before the fermentation begins: and in that case it will work so long, that when it fines, the cyder will be hard: for when the apples are too mellow, they will break into so small particles, that it will be long before the lee settles by its own weight only; and then the fermentation may begin before it be separated, and so destroy your intention of taking away the gross lee. And if the apples be not mellow enough, the cyder will not be so pleasant as it ought to be."

To the cause above assigned by Sir Paul Neile for the liquor's fermenting too much, another may be added; namely, that as the summer fruits are fermented earlier than the hard apples, the warmth of the weather hurries the fermentation on too fast, and by this means renders the liquor much less palatable: or it may even hurry it beyond the vinous state, till the acetous fermentation begins. The sweetness of the summer fruits make them likewise more liable to ferment too much; whereas the sour roughness of hard apples retards that operation, and makes a longer time necessary to perfect the vinous fermentation. These causes render it necessary that great care be taken in preparing the juice as directed by Sir Paul, and that there be a cellar in which the heat is suited to carry on as slow a fermentation as possible. If the maker of the cyder is not provided with such a cellar, the juice of the apples may be buried in cold spring water, as before mentioned, and be kept there till the temperature of the weather becomes fit for its being fermented.

"What has been said of the time for making the pepin cyder, may, adds Sir Paul Neile, with due allowances for the nature of the apples, serve for all other summer fruit; as the Kentish-codlin, marrigold, gilly-flowers, summer-pearmains, summer-pepins, Holland-pepins, golden-pepins, and even winter-pearmains. For though they must not be made at the same time of the year, yet they must be made at the time when each respective fruit is in the condition before directed for the pepin. Nay, even in the making of that cyder, you are not tied precisely to that particular time, but, as the condition of the year hath been, you may make your cyder one, two, three, or four weeks later."

When the pressing of the apples is finished, the most careful makers of cyder strain their liquor through a hair sieve, to separate from it the coarsest dregs; which is a practice every way advisable. It must then be left to itself, till it has undergone the necessary fermentation, and deposited its grosser lees. To this purpose some put it immediately into hogsheads, others into large tubs or vats, and the most curious into a vessel intended for that very use, wide at top, and growing narrower all the way down to the bottom, near which is a tap to draw off the liquor. This vessel is fixed upon a stand, or stilling, and frequently contains from five to twenty hogsheads. In these vessels the heavier lees subside, and the lighter form at top a crust, which, by its sinking afterwards, gives timely notice that the ferment is gone off, and that the liquor is fit for racking. Some gentlemen, who spare no pains to make their cyder as fine as possible, think that the excellence of the liquor depends greatly on catching the very instant when this crust breaks; and in order to be sure of it, they set a person to watch and give immediate notice of the crack or noise which the crust makes in breaking. They hold this to be the critical time for racking off the liquor, and maintain, that so much of its spirit is evaporated very speedily after, as to render the cyder irrecoverably vapid. This, therefore, should be carefully attended to; and upon the first appearance of the crust's falling, the cyder, which is then become tolerably fine, should be drawn off the grosser lees, and tunned into the hogsheads. The usual time taken up in this primary fermentation is from thirty-six to forty-eight hours; more or less, according to the weather. Some affirm that they have had good cyder by tunning it directly from the press, without any other caution than leaving room for the liquor to ferment in the hogshead, where it remained from first to last: but this method is liable to many hazards, and successful, where it has been so, only in favourable seasons. The gross lees are apt to rise on every considerable change of weather, and when they do, they set the cyder on the fret, which, should it do no worse, certainly robs it of its spirit, and, when over, leaves it flat and vapid. Besides, repeated experiments have proved, that sourness in all fermented liquors begins ever at the lees, and therefore the more of them is left among the cyder, the more readily it will turn eager.

Here I must observe, that a most important precaution is too often overlooked by many of those who make cyder of winter fruits; for that a sufficient warmth of the air is as essential to ferment the rough juices of hard apples, as it is dangerous to suffer the heat to be too great in the fermenting of cyder made of summer fruits. If the weather is very cold when the hard apples are pressed, the help of fires should be recurred to; or if that has been neglected, or could not be conveniently used, it will be right to carry the cyder to a place warmed considerably by the sun for a short time in the summer, and there to place it out of the immediate reach of the rays of the sun. The bung of the cask must be loosened, because there will arise a degree of fermentation, which will attenuate any viscidity not overcome by the first fermentation. Great care must be taken that this fermentation be not carried beyond the nice point of correcting the rough raw taste of the fruit: for if it goes farther, the liquor will either become vapid, or turn to vinegar. As soon as the desired point is obtained, the liquor should be racked off, especially if much feculence has sunk to the bottom, and it should then be carried down into the vault, where it may be preserved long in perfection.

The choice of proper vessels to keep the cyder in after it has fermented is very material; no liquor being so apt as this to take the taste or tang of the cask. New vessels, though the wood be ever so well seasoned, generally give a disagreeable relish to all liquors, and will do so remarkably to cyder, unless due caution be used before-hand. Frequent scalding with hot water, into which some handfuls of salt have been first thrown, or with water in which some of the pomice has been boiled, and washing afterwards with cyder, are the usual remedies against this evil, and seldom fail of removing

moving it effectually. Of old casks, beer vessels are the worst: they always spoil cyder; as, in return, cyder casks infallibly spoil beer. Canary and brandy casks do well, and all wine vessels tolerably; for, provided the tartar adhering to their sides be carefully scraped off, and they well scalded, there is no danger in using them. The best way of scalding them, is to boil a parcel of dried wormwood in water, and with that and a brush of the same plant to rub and scour their insides. This will correct the acid of the tartar; and so will likewise all vegetable ashes used in the same manner. Those who advise fumigating the casks with brimstone, confidently affirm that the cyder becomes stronger, and keeps better, when the vessels have been thus prepared, and for this reason they tun immediately after the operation, and before the smoak evaporates. To enable such as may choose to examine, by fair trials, how far this is true in fact, I shall here add the neatest method of performance. Melt a pennyworth of brimstone, and dip in it a piece of new cloth, or of canvass, till all the brimstone is imbibed, and the cloth or canvass looks like a piece of searcloth: then roll it close, tie it, and with a wire suspend it at the bung, three parts in four within the vessel; light it, and let it burn till it is ready to fall into the cask, then take it out, and tun without delay. Some add a little powdered cinnamon, cloves, pepper, or other spice to the brimstone for fumigating; but I see no great reason for their so doing.

The best shaped vessels for keeping cyder in are, as advised by captain Sylas Taylor, in a letter subjoined to Mr. Evelyn's Pomona, and by Mr. Worlidge, those of which the barrel-boards are strait, the vessel broader at one end than the other, and standing on the lesser end, with the bung-hole in the top. The advantage of this form is, that in the drawing of the cyder, though but slowly, the skin or cream contracted by its fermentation (as is the case of all strong liquors) descends, and covers the liquor by means of the tapering of the vessel, and thereby preserves to the last the spirits of the cyder, which would otherwise evaporate and waste. A little wheaten-bran cast in after the fermentation, thickens this coat or cream of the liquor, and thereby conduces much to its preservation.

We come now to a point of great importance, and hitherto of as great uncertainty, which has raised among the curious a controversy of long standing, and not likely to be brought to a speedy decision, without a course of regular experiments. Some maintain, that continued fermentation and frequent racking certainly spoil the cyder; whilst others assert, that it can never be good without them. Some rack once, some twice, and others whenever the liquor frets. Some look upon the lees as the food and nourishment of cyder: others, as a cause at hand, upon every change of weather, to set it on the fret, and turn it sour. Every man has a system of his own, and a peculiar practice consequent thereon; and so great is the variety of methods, that nothing certain can be drawn from them but this one general conclusion, that we are still at guess work, and must be obliged to future trials for any rules that can be thoroughly depended on. I shall therefore here relate the several ways now in use, and then give my own general opinion of this matter: but I strongly recommend the making of accurate experiments on each.

One method is, to leave the cyder in the vats some days longer than was before advised, and till it fines in a great measure: then to tun it into hogsheads, where it is to remain without any farther racking. Those who recommend this practice say, that their cyder is thereby rendered the stronger and mellower: and those who object to it reply, that lying on the grosser lees, which cannot all be fallen in the vats, it must be apt to fret, turn foul, and, in unsettled weather, eager.

A second and more common method is, a fortnight after tunning, to rack into other hogsheads. There the cyder undergoes a second gentle fermentation, and while this lasts the bung must be left open; afterwards, when the fermentation lessens, covered only with a wet cloth, or a tile; and when it is quite over, stopped down close with well tempered clay, kept moist, to prevent its cracking, by strewing over it a handful of bay-salt.

To this second racking others add a third in March or April, when the lees have thoroughly subsided. This again is followed by a little fermentation; and for that reason chiefly it is objected to by those who think every fermentation hurtful which is not strictly necessary.

Others, on the contrary, and particularly those of Devonshire, where the strongest cyders are made, look upon thorough fermentation as the great secret to have their cyder fine, light, and free from dregs, and accordingly they not only approve of the above last mentioned method, but proceed much farther, as follows:

At first tunning they do not fill their hogsheads to the bung, but leave an empty space to receive a pailful of fresh cyder from the press: this renews or increases the fermentation, and sets the whole on working with some violence. The froth which rises at the bung is carefully skimmed off, and the waste of liquor thus occasioned is constantly replenished with unfermented cyder. By these means the whole is kept from the fret for a considerable time: for it is not uncommon to have cyder thus managed working for a fortnight. A month after this operation, and the stopping of the vessels, the cyder is racked, and, generally speaking, in two months more a second time: and if it frets, which however is said seldom to happen in this method, it is racked off a third and a fourth time.

To make a proper choice among the several above recited methods, they should be tried together, with the same fruit, of equal ripeness; the cyders should be kept to the same age, and their different qualities should be attentively observed. Just information cannot be obtained in any other way: for the want of accuracy and exactness will render the experiment fruitless and insignificant. Every one will tell you, that his method affords good cyder: but this general expression gives no determinate idea, and forwards knowledge very little. Would gentlemen be at the trouble to keep notes, and minute down all the differences observable in the same cyders under different managements, it might soon be known what method gives the strongest, which the neatest, the roughest, mellowest, or lightest cyders; and every one might then pursue, as his taste or interest should direct, that which would answer best: but till something of this kind be done, only very slow and inconsiderable improvements can be expected.

In the mean time I must observe, in general, that whenever the lees of cyder are in such quantity as that the liquor cannot preserve them from a tendency to putrefaction, as must be the case with the first, and generally the second lees, it is certainly advisable to rack off the liquor; and that, if the cyder is kept in a place not subject to the various changes of the weather, the little fermentations raised by racking cannot be attended with any great danger; nor will the frettings return. But as to the frequently repeated fermentations which are said to be, of choice, the practice of the makers of cyder in Devonshire, they surely are by no means advisable.

The few points which experience has hitherto determined in regard to the making of cyder are, that weak cyder cannot bear above one or two rackings without too great a loss of spirits; that strong cyder made of winter apples will stand several rackings, and thereby grow mellower, and be the sooner fit for drinking; that the more the liquor is fermented, the rougher it will grow; that fermentation is no other way so well promoted, as by putting into the hogshead from time to time some of the liquor fresh drawn from the press; and lastly, that to have a rich, racy, palatable cyder, a little inclining to the sweet, great care must be taken to prevent all future fermentation after the liquor is once become fine. If it should be foul, isinglass will help to fine it, by precipitating the flying lee.

In general, the cyder that is longest in fining is the strongest and most lasting, if it has been made of thoroughly ripe fruit: but, as was before observed in the article of wines, all liquors will be much longer in clearing in mild moist weather, than in cold dry weather or frost.

When the bung-hole of the vessel is closed up, a small vent-hole should be left open, or but loosely stopped with a peg, for several days, till the wild spirit of the liquor be spent;

ſpent; for otherwiſe it will break the caſk, or find ſome other vent, which, though but ſmall, will always abide open, and prove the ruin of the cyder. Many have ſpoiled their cyder by this only neglect, and never apprehended the cauſe thereof. After this wild ſpirit is ſpent, the vent-hole, as well as the bung, ſhould be ſtopped quite cloſe; and then the cyder, though ſeemingly flattiſh at firſt, will ſoon improve, and become briſk and pleaſant.

Deadneſs or flatneſs in cyder, if occaſioned by a two free admiſſion of air into the veſſel, for want of right ſtopping, is remedied by grinding a ſmall parcel of apples, and putting them into the caſk, which ſhould then be ſtopped up cloſe: but care muſt alſo be taken to open the vent ſometimes, or the veſſel will be in danger of burſting. The liquor thus managed muſt likewiſe be drawn off in a few days, either into bottles, or into another caſk, leſt the murk ſhould corrupt the whole maſs; to prevent which, ſome put in only the juice of the newly preſſed apples. The ſame may be done to flat bottled cyder, by adding about a ſpoonful or two of new muſt to each bottle of the dead liquor, and ſtopping it again. Cyder that is dead or flat will often revive again of itſelf, if cloſely ſtopped, upon the revolution of the year, and the approach of ſummer: but cyder which has acquired a deadneſs or flatneſs by being kept in a beer veſſel, cannot be revived again.

Thick cyder may be rendered clear and good by a ſecond fermentation, or, ſometimes, by only throwing into it two or three quite mellow apples. But cyder in which the acetous fermentation has taken place, can never be reſtored. If it be only a little ſouriſh, or drawn off in another veſſel, about a gallon of wheat (blanched is beſt) to a hogſhead of cyder, and ſo in proportion for any other quantity, will both amend and preſerve it: or if it is ſo ſour that the wheat does not anſwer that purpoſe, it may be corrected by egg-ſhells, powdered alabaſter, &c.

Cyder which has contracted any ill flavour or taſte from the veſſel, or from any other cauſe, will be helped by the addition of a little muſtard ſeed ground with ſome of the cyder.

Ginger accelerates the maturation of cyder, gives it more briſk ſpirits, helps fermentation, promotes its duration, and corrects its windineſs.

When the juice is too thin or weak, it is a common and very adviſable practice to give by art that ſtrength which nature had not beſtowed. To this end, raiſins of the ſun, or the lees of rich wines, are uſed with good ſucceſs; as is alſo ſugar. Writers on this ſubject give various directions for the uſe of this ingredient: but it would be needleſs to repeat them here, as it is of very little importance in what manner it be done, the giving a body to the liquor being the only thing wanting, and this a proper quantity of ſugar will effect, in whatever ſhape it is uſed. When the deſign is to colour the cyder, the ſugar is boiled till it becomes brown, and then put into the caſk.

CYTISUS, the name of a plant much cultivated by the old Romans for the food of cattle, and called by ſome ſhrub-trefoil, and by others ſhrub-lucern.

It riſes to the height of five, ſix, or even more feet, with a ſhrubby ſtalk, covered with a greyiſh bark, and divided into many branches, covered with a hoary down while they are young, and garniſhed at each joint with trifoliate leaves ſtanding upon foot ſtalks about an inch in length. There are two or three of theſe at each joint, ſo that the branches are cloſely covered with them. The lobes are ſmall, ſpear-ſhaped, and hoary on their underſide; and theſe leaves remain all the year. The flowers, which are of a bright yellow, blow on foot-ſtalks which ariſe from the ſides of the branches, each foot-ſtalk ſuſtaining four or five flowers; and theſe are ſucceeded by compreſſed moon-ſhaped pods, each containing three or four kidney-ſhaped ſeeds.

The cytiſus may be raiſed either from its ſeed ſown about the middle of October, or in the beginning of April; or if greater ſpeed be deſired, from cutting ſlips, or layers, planted in the ſpring or autumn, ſo as to leave a ſpace of four feet between each plant. Such are the directions of Columella, who adds, that if the ground be well dunged for this planting, and well hoed up round the plants, which ſhould be watered during the firſt fortnight, if rain does not fall, plentiful crops may be obtained from this excellent vegetable, equally fit for horſes, oxen, cows, ſheep, hogs, goats, and poultry. It is alſo ſingularly profitable for bees, whoſe honey it increaſes prodigiouſly. It has the ſame effect upon the milk of cows, beſides greatly improving its quality. In the kingdom of Naples the goats feed upon it, and great quantities of excellent cheeſe are made from their milk. In the iſlands of the Archipelago, the Turks make handles for their ſabres of the wood of this ſhrub, which, when full grown, is as hard as ebony, and of a fine yellow colour. It will bear cutting as often as its ſhoots are about fifteen or eighteen inches long, which may be ſeveral times in the year; for it ſhoots and flowers during eight months in the countries where it grows well, and continues green during the whole winter, if the ſeaſon be at all favourable. Its ſeeds begin to ripen towards the end of Auguſt, and continue to do ſo until the cold ſtops them. It will be fit for cutting at the end of three years at fartheſt, and ſhould be carefully kept clear of weeds, and hoed up between each cutting. If given as green fodder, which it affords during eight months of the year, about fifteen pounds weight of it are ſufficient for the daily food of a horſe, twenty pounds for an ox, and ſo in proportion for other cattle, according to their ſize and ſtrength. When made into hay, it ſhould be given more ſparingly, becauſe it is then more nouriſhing. In this ſtate it ſhould be ſteeped in water, before it is given to cattle, and then be mixed with chaff or ſtraw. The time of cutting it for hay, is when the greater part of its ſeeds begin to grow large; and the manner of making this hay is, to let the ſwarths lie ſome hours in the ſun, till they are faded, and then to dry them thoroughly in the ſhade. *Columella De Ruſtica, Lib.* V. *cap.* 12.

Mr. Miller allows the cytiſus every quality that can recommend it for the feeding of cattle in the countries where it grows naturally, ſuch as the iſlands of the Archipelago, Sicily, and the warmeſt parts of Italy, but is perſuaded that it will not thrive in England, ſo as to be of any real advantage for that purpoſe here; becauſe it cannot bear ſuch hard froſts as we ſometimes have; or if it does not bear them ſo far as not to be abſolutely killed, it will be ſo much damaged thereby, as not to be able to recover its verdure before the middle or latter end of May; nor even then to put forth ſhoots that will bear cutting more than once in a ſummer; beſides, their being ſo woody, if ſuffered to grow to any conſiderable length, as to render that cutting very troubleſome, and of little ſervice by way of fodder. He therefore thinks, upon the whole, that it can never anſwer the trouble and expence of cultivation in this country, where we have many other preferable plants; but that, in hot, dry, rocky countries, of which we have now ſeveral in our colonies, where few other vegetables will thrive, this may be cultivated to great advantage; for it will live there many years, and proſper very well.

D.

DAB-CHICK, a chick newly hatched.

DAFFODIL, the name of a well-known flower, of which there are feveral fpecies. The common fort grows naturally by the borders of woods, and fields, in many parts of England; this hath a large bulbous root, from which come out five or fix leaves, about a foot long, and an inch broad, of a greyifh colour, and a little hollowed in the middle, like the keel of a boat. The ftalk rifes a foot and a half high, having two fharp longitudinal angles; at the top comes out a fingle flower, inclofed in a thin fpatha, or fheath, which is torn open on one fide, to make way for the flower to come out, and then withers and remains on the top of the ftalk. The flower is of one petal, or leaf, being connected at the bafe; but is cut into fix parts almoft to the bottom, and thefe all expand. In the midft of this is fituated a bell-fhaped nectarium, called by gardeners a cup, which is equal in length to the petal, and ftands erect. The flower nods on one fide of the ftalk. The petal is of a pale brimftone colour, and the nectarium yellow. It flowers in the beginning of April; and after the flowers are decayed, it turns to a roundifh capfule, with three cells filled with roundifh feeds, which ripen in July. This fort propagates very faft by off-fets from the root. For the method of cultivating the more curious fpecies of daffodil, *fee the article* NARCISSUS.

DAG, dew hanging upon the grafs.

DAIRY, the occupation, or art of making various kinds of food from milk, particularly butter and cheefe. It alfo fignifies the place where thefe operations are performed.

The following account of managing a dairy was written by a gentleman who has for a confiderable number of years employed himfelf in that bufinefs, and acquired by his induftry a plentiful fortune.

He begins with recommending the cultivation of faintfoin to every perfon concerned in a dairy, as it is obferved to increafe the milk of cows, both in quantity and quality, above any artificial pafture yet known, and therefore he advifes the farmer to keep his cows upon it, and form a five years dairy.

" An acre of the worft land, continues he, will, when improved by this grafs, maintain four cows very well from the firft of April to the end of November, and afford befides a fufficient ftore of hay, to make the greater part of their fubfiftance the four winter months following. You muft buy then about four hundred milch-cows, but take care you chufe them with judgment. I have bought your largeft fort of runts from Wales, for lefs than fifty fhillings a cow, with a good calf by her fide, which I always difpofed of as foon as I could. You will obferve, that I make too good an ufe of the milk to afford the calf his fhare of it: I generally keep thefe cows above twelve months, and then, felling them, fometimes for four pounds a-piece, I ftock myfelf with fuch that are new milched. I obferve this rule every year, and the trouble is fufficiently rewarded by the advantage it brings me; for befides the profit I make by felling dearer than I buy, I avoid the inconvenience of having any thing to do with bulls, and the confequences; fo that I always preferve my cows in their full milk, and find it no uncommon thing for one of thefe milch-cows to be milked twice a day, and afford a gallon and an half at a meal. Four hundred of thefe cows will coft a thoufand pounds; and you will find, that, coming from a poor pafture to a rich, they will profper and increafe both in milk and fize. In eight convenient places about your hundred acres let there be built eight thatched fheds, a little rifing in the middle to carry off the water; the height may be ten feet, and the breadth thirty; each of thefe fheds fhould be a hundred and twenty-five feet long, and, under the higheft part, directly in the middle, you muft raife a flight partition, lathed and plaiftered, which ferves to fupport the ridge of the roof, while the two fides are fuftained by fquare wooden pofts, about eight feet high, and placed at proper diftances.

" On either fide of the partition wall let there be fixed a kind of rack, like thofe in ftables, which is to run the whole length of the fhed, and muft be placed as high as a cow can reach her fodder from. The fhed muft next be divided into ftalls, like thofe for ftone-horfes, and each ftall will be above five feet broad; the length of thefe ftalls muft be exactly fitted to that of a cow, that a crofs bar, being placed at the outward end, may keep the beaft from running backwards: thus every fhed will hold fifty cows, five and twenty on each fide of the partition: to every one of thefe fheds you muft appoint a man, whofe bufinefs it will be to clear the place, and carry off the dung; as alfo to mow the faintfoin every day, and give it to the cows in the rack before-mentioned: this man beginning at one end of his proportion of ground, and going gradually on to the other, the firft place will always be fit to mow again by that time he has gone through his whole divifion. Your cows are thus fed at difcretion, with neither too much nor too little; they are not peftered with the fcorching heats, nor troubled with the ftinging fly, which, in open paftures, often makes them whifk about, and trample down more grafs than they eat. At each end of every fhed you muft build a flight room of brick, thirty feet fquare, and ten feet high, which is to be divided, the crofs-way of the fhed, into two partitions, each fifteen feet broad, and thirty feet long; that which joins the cow-houfe muft be paved with tiles, and is to ferve for a dairy; the other muft be floored and windowed, and is to be a lodging-room for the dairy-maids. Every fhed will require five maids, that is, to every ten cows one dairy-maid; fewer might ferve, but it is better to exceed, than fall fhort, in this particular. Thus each dairy will have two or three maids belonging to it, whofe lodging will be the room adjoining, and whofe care is to extend to the fhed on both fides the partition, to the five and twenty cows which are the neareft to their ftation. All along both fides of the partition, at about a foot above the ground, let there be fixed, clofe to the wall, a ftrong

pipe

pipe of lead, a little lefs than an inch diameter; both which pipes, being fomewhat raifed exactly in the middle of the fhed, muft have a gentle and almoft an invifible defcent from that rifing to the dairies, through the wall of which their nether ends are to be brought, and there wrought into one another, that whatever defcends through them, into either of the dairies, may have iffue but at one mouth. This mouth of the pipes muft be made very fmall, and neatly fitted into the hollow end of a ftrong wooden axle-tree; which, whilft it is turning fwiftly round the mouth of the pipe, may by no means ftrain it by the motion, but receive, into its own hollow, the milk which defcends through the leaden pipes, without fpilling any, and paffes fo far through a wheel, or veffel like a barrel, only much larger in its circumference. The axle-tree, which this veffel is to turn upon, is bored very full of round holes, through which it delivers the milk into the veffel, as faft as it receives it from the pipe.

"The veffel muft be capable of containing, at leaft, three times the quantity of milk, which it is defigned to receive; and there muft be fix wings or thin pieces of wood, glued on edge-ways to the wooden axle-tree, whofe length and breadth muft be fo contrived, as to leave a free fpace of fix inches at either end of the axle-tree, and a foot between their edges lenth-ways, and the fmooth infide of the veffel; in the moft convenient part of which muft be contrived a door, to open and fhut down upon occafion, as clofely as if there was none. This door will perform its work very neatly, if you line the infide and edges with fome kind of cloth, which is commonly ufed in the preffing of cheefe. The other folid end of the axle-tree muft extend itfelf about five feet longer; and the whole length may be fupported by fquare wooden pofts, and turn in their tops, which are to be made hollow, and kept greafed for that purpofe. This end of the axle-tree is to be faftened into a wheel, exactly like thofe which are ufed in many places for roafting of meat. The diameter of this laft wheel muft be within fix inches of the height of the dairy, and two or three large dogs, being put into it at a time, will turn it with extraordinary fwiftnefs: the dogs are eafily taught, and will at laft take delight in the exercife. I have brought up a large buck to the practice of this labour, and it is wonderful to fee the force with which he runs round an hour or two together, and turns a wheel of ten feet diameter; but you muft make your wheel as light as it can poffibly hold together. I have but one thing more to fay, and I finifh this direction: pretty near that fide of every ftall in your fhed, to which the maid muft come to milk the cow that belongs to it, let a hole, as fmall as will ferve the occafion, be contrived by your plumber, in the uppermoft part of the leaden pipe, to fhut and open with a little fcrew, which fcrew, for fear of lofing it, may be faftened by a little iron chain to the body of the pipe. I have endeavoured, in the defcription of all this, to make my meaning as plain as poffible, and hope the reader will, with a little attention, comprehend the whole."

The ingenious Mr. Lifle obferves, that fo much cleaning and fcalding is neceffary, that the dairy farmers fpend as much wood in fire, for that purpofe, during the fummer, as they burn for other purpofes in the winter.

If the milk veffels are not kept clean they will be four, and the cheefe will be four before it can come, and it will eat four and choaky. A cold dairy is a great means of preferving cream from turning four. The milk-houfes fhould alfo be large, for otherwife the fteam arifing from the hot milk as brought in from the cows, will heat the air of the room.

Care fhould be taken when cows begin to give off their milk, to milk them clean; for if this be neglected they will foon grow dry. Cows generally begin to give off the height of their milk about the time of the bloffoming of the wheat, and continue fo till a good aftermath comes on, when their milk will increafe; but cold and rainy weather in the autumn will foon abate their milk again. Perhaps the reafon why the milk of cows abates about wheat bloffoming time is, becaufe about that time the grafs of the field bloffoms alfo, and the flufh of the fap is come to its height and maturity, and then abates, for the roots of the grafs at that time begin to harden and grow dry; nor do they take in the juices of the earth fo freely as they did before, and therefore grow drier and drier, till the feed is hardened. The feed being thus brought to maturity, the roots of the grafs for fome time, till the cold of the winter checks them, ftrike frefh fap roots, or buds, preparative to the enfuing fpring, and which will the next year be the fpring roots and increafe. On thefe new efforts the ftart of the autumn grafs depends, till the cold checks it. This grafs is called the aftermath, and upon the growth of this the cows milk depends.

It has been obferved, that the milk of the hill-country cows do not yield the fame proportion of cream, as that of the vale cows; owing, in all probability, to the poverty of the hill-country cows, which are generally poor in cafe.

Thunder will break the cream, and turn the milk in the milk-pans, fo that no cream can be fkimmed off for butter; nor will the cheefe-curd hold together, but will break afunder.

It is commonly faid, that a quart of cream will make a pound of butter; but this muft be underftood of cream, that hath ftood two or three days to fettle, for three pints of cream juft fkimmed from the milk will, in three days, be reduced to nearly a quart. If you bring in the milk and ftrain it immediately into the pans, without letting it firft ftand to cool, the cream produced by it will be much lefs, than it would have been, if the milk had been fuffered to ftand and cool before ftraining.

In fome parts of Dorfetfhire they fet the milk over the fire in brafs pans to warm, which makes the cream rife, and when a bladdle is formed in the middle, they take the pans from the fire, fkim off the cream, and put it into a tub. After this the dairy-maid, by only putting her hand, and ftirring it about in the tub, brings it prefently to butter, without the help of a churn. The butter made by this method is very rich, but the cheefe made from the fkim-milk very poor. *See the article* Cheese.

The hill-country farms are not fo well adapted to a dairy as thofe in the vale; becaufe the foddering feafon in the former holds fo much longer, occafioned by the rowet-grafs falling of a month fooner, and the fpring-grafs coming a month later than in the vale. *Lifle's Hufbandry, vol.* II. *p.* 139.

A correfpondent of the editors of the Mufeum Rufticum has given the following account of the profits of a dairy kept on twenty acres of land, which he fuppofes to be an addition to a farm, not one by itfelf. Nothing therefore is allowed for the feed which the cattle may accidentally have on the arable land, or turnips, which they may expend in the winter.

EXPERIMENT, 1763.

Food, Produce, and Expences of a Dairy *of four Cows in a Year.*

Their food, four fmall paftures, amounting to fixteen acres, or thereabouts. Two of them I fed in the fpring, rather late before I fhut them up for hay: another, of fix acres, the cows had to themfelves till the others were mown; and then I fhut that up for a rowen (aftermath) crop of hay, cutting it the twentieth of Auguft.

Therefore they had firft that of fix acres, another of two acres, which is common for all my cattle, being never mown; next a five acre piece, after the hay was cleared from it, and then the other field of three acres: befides which, they ran four days in my clover, till finding the butter tafted, I took them out.

It will appear alfo by the following account, that they eat in winter one ton and feven hundred weight of hay, and two loads and a half of ftraw bought for them, befides their fhare of fome which grew on my farm, the whole of which (foft corn ftraw) amounted only to five acres of oats for them and four horfes too; the chief of my lands lying that year fallow.

EXPENCES.

	l.	s.	d.
1763. April 27. For two hundred weight of hay	0	5	0
Auguſt 8. Twenty-five ditto – – –	1	17	6
Nov. 30. A load of ſtraw – – – –	0	14	0
Dec. 30. Half a ditto – – – – –	0	5	0
1764. Feb. 15. Ditto – – – – – –	0	3	0
Feb. 20. A load ditto – – – – –	0	11	0
Sundry expences, viz. pans broke in dairy, cheeſe-cloths, bruſhes, brooms, ſalt, &c. came exactly to – – – – – – – –	0	10	10
	4	6	4

In the above account is included nothing for firing, which coſt me very little, as the ſmall buſh-faggots, which I grub up on borders of fields to clear them for the graſs to grow, completely ſerved my dairy this year: theſe are difficult of ſale, fetch but little, and muſt be rooted up if no cows are kept.

The cook in the family managed as dairy-maid: there are in this reſpect great diſadvantages in only keeping four cows, if a dairy-maid is alſo kept to attend them; for ſhe may manage (and they do in this neighbourhood more, in proportion) eight or ten cows, as well as four, which alters the proportion of the expence greatly; and in firing it is but a ſmall addition of wood to the addition of four or five cows.

PRODUCE.

				l.	s.	d.
Butter, milk, and cream, uſed in the family; the butter ſixpence per pound, the cream ſixpence per pint, the milk one halfpenny per pint (the market prices) – – – – –				9	4	8
Seven hundred and ſixty pounds of cheeſe, ſold at two-pence halfpenny per pound – – –				7	8	6
The value of two yearlings, kept for ſtock (valued by a farmer, who offered to take them at the price) –	3	10	0			
Two ſucking calves, ſold at – – –	0	15	6			
				4	5	6
				20	18	8
Deduct expences – – – – – – – – –				4	6	4
Profit, four pounds three ſhillings per cow,				16	12	4

EXPERIMENT, 1764.

Food, Produce, &c. of four Cows a Year.

Paſtures the ſame as the laſt year. Turned them into an acre of the five acre field the ſixteenth of May, beſides which, they had three acres to themſelves. Mowed this year the ſix acres, and the remaining four of the five acres. No clover.

EXPENCES.

1764.	l.	s.	d.
April 26, and May 8. Cloths, pans, bruſhes, ſalt, &c. – – – – – – – – –	0	8	10
Faggots for firing – – – – – –	1	10	0
Eighteen hundred weight of hay – –	2	5	0
Half a load of ſtraw – – – – –	0	6	0
May 6. Four hundred weight of hay – –	0	10	0
July 1, and Auguſt 6. Salt, cloth, lead, mending brooms &c. – – – – – –	0	5	10½
October 10. For ſundries – – – –	0	9	2
	5	14	10½

The fire-wood was moſt of it this year bruſh-faggots out of a wood, and but few of the ſmall buſh-faggots: I am therefore enabled better to calculate their value. Beſides the ſtraw bought, they had what was to ſpare of my farm.

DAI

PRODUCE.

1764.				l.	s.	d.
June 14. Three calves, ſold to the butcher				3	6	0
Aug. 18. Seven pounds and a half of butter				0	3	9
Nov. 1. For two hundreed and thirty-eight pounds of butter made to October 22				6	4	9½
For four hundred and ſeventy-three pounds of cheeſe, at two-pence halfpenny per pound, made to the end of Auguſt – – – – – – – – – –				4	18	6½
For milk and cream to October 22 – –				1	11	6
March 1. For eighty-two pounds of butter from October 22, to January 17 –				2	8	0
For milk and cream to February 14 –				0	10	6
For two hundred and thirty-ſix pounds of cheeſe, eighty at two-pence halfpenny, and one hundred and fifty-ſix at two-pence per pound – – – –				2	2	8
Sold two heifers, the laſt year's yearlings, for – – – –	7	0	0			
Valued, &c. at then – – –	4	5	6			
				2	14	6
				24	0	6
Expences – – – – – – – – – – –				5	14	10½
Profit, four pounds eleven ſhillings per cow				18	5	7½

There are ſome very material obſervations to be made on this account. Is four pounds three ſhillings the value of a cow's feed a twelvemonth? Surely not. Two ſteers, or heifers, may be kept and fatted in the place of one cow: theſe will undoubtedly pay better.

I am aware of the objection, that a dairy is never ſuppoſed to anſwer well without a good dairy-wife to do all the buſineſs of it. This certainly makes a material alteration: but four pounds a cow is, in this neighbourhood, thought pretty near the profit of one, at leaſt as farmers wives own. Yet it muſt be evident, if there was no farther conſideration, a dairy muſt be attended with conſtant loſs: this conſideration is the advantage derived from the hogs, which evidently compoſes the whole profit of a dairy.

I am not yet able, from experiments, to aſſert how many hogs may be kept on a given number of acres without the aid of a dairy: this is neceſſary to be known before the exact profit of cows can be aſcertained. The ſpring litters ſtand greatly in need of the milk and whey, which is then coming on; ſo that few, I doubt, could be bred at that time of the year without them.

I ſhall, every year, make all the obſervations I can on the feeding of them, to be able to judge better for the future.

I ſpeak from experience, and know well that grazing, were it not for the hogs, would be more profitable than four pounds per cow.

I come now to ſpeak of my hogs; and in this point, like the laſt, I ſhall quote a page or two from my manuſcript regiſter of experiments.

EXPERIMENTS, 1763.

Food and Produce of a Sow, and the Pigs bred by her, in a Year.

She pigged in April ſeven pigs, and in October eleven.

EXPENCES.

1763.	l.	s.	d.
Nov. 18. For two coomb of drains – – –	0	1	4
Cutting a litter – – – – – – –	0	1	6
Dec. 8, and Jan. 21. Ten coomb of peaſe –	5	1	0
Expences on ditto – – – – – –	0	1	0
For ten buſhels of barley – – – –	1	0	0
Feb. 17 and 25. Expences in ſelling – – –	0	11	6
For nine coomb of drains and expences	0	7	6
For two coomb and two buſhels of peaſe	1	6	3
March 12. Drains – – – – – – – – –	0	1	6
	8	11	7

PRO-

PRODUCE.

		l.	s.	d.
Oct. 30.	A ſucking pig	0	2	3
	A fat roaſting hog	1	9	0
	A fat hog, one hundred and ten pounds weight	1	12	9
Feb. 17.	Ditto, one hundred and ſixteen pounds weight, at four ſhillings and ten-pence per ſtone	2	0	0
	Heads, &c.	0	5	3
Feb. 22.	Three fat hogs ſold alive	6	7	0
	One ditto, at four ſhillings and ten-pence per ſtone	2	0	0
	Ten live pigs, carried to next year's account, valued at	4	16	6
		18	12	9
	Expences	8	11	7
	Profit	10	1	2

The dairy this year was four cows: all the whey and ſlet milk was thrown into the hogs ciſtern, together with the diſh-waſh and offal of the kitchen, and the drains of about twenty coomb of malt uſed in the family, beſides which, thirteen coomb more I bought for them: all this compoſed their common waſh while lean: for three months in the ſummer, the ſow and the ſeven pigs ran in my clover. Theſe articles, beſides common graſs, (on which, by the bye, they feed as well as ſheep) were all their lean food.

Now, from the above account muſt be deducted the value of the clover-feed, as that certainly was not from graſs-ground, and may be eſtimated. Such deductions I have no objection to, as we may come near the mark in valuing: my calculation, however, does not require them, as the twenty acres were to have been an addition to a farm, not one by itſelf.

	l.	s.	d.
Seven hogs, at fourteen-pence per week, for three months, come to	0	14	0
Thirteen coomb of drains	0	10	4
	1	4	4

But let theſe two articles be ſtated at two pounds one ſhilling and two-pence; the propriety of the ſums mentioned in my calculation for the profit of a ſow will not be impeached thereby.

EXPERIMENT, 1764.

Food, Produce, &c. of Hogs a Year, maintained by a DAIRY *of four Cows.*

The old ſow pigged in April, eleven, and again in November, twelve; the young one ſeven, in January, 1765.

EXPENCES.

1764,		l.	s.	d.
	Ten pigs, from laſt year's account, to be reckoned here	4	16	6
May 6.	For eighteen coomb of drains	0	13	2
19.	For two coomb of ſhorts	0	4	0
	For ſeven coomb and two buſhels of drains	0	5	6
19.	For a young ſow and boar	1	4	0
28.	For eighteen coom of drains	0	12	8
July 2.	For two buſhels of ſhorts	0	1	0
19.	For four coomb ditto	0	8	0
Aug. 23.	Expences in ſelling	0	5	0
	For two buſhels of oats	0	4	0
Oct. 12.	For five coomb of drains	0	2	11
	Sundry expences	0	1	6
Nov. 1.	For one coomb of ſhorts	0	2	0
13.	For two buſhels ditto	0	1	0
	Expences in ſelling	0	3	5
24.	For one coom of ſhorts	0	2	0
Dec. 17.	For one buſhel ditto	0	0	5
		9	7	1

1764,		l.	s.	d.
	Brought over	9	7	1
Dec. 22.	For three buſhels ditto	0	4	6
28.	For tail barley	0	14	3
29.	Grinding ditto	0	0	6
Jan. 3.	For bran	0	1	6
	Cutting pigs	0	1	6
8.	For ſixteen coomb of drains	0	10	8
12.	Grinding barley	0	1	0
30.	Six coomb of drains	0	4	0
25.	For ſix buſhels of barley	0	14	3
Feb. 1.	Grinding	0	1	3
22.	For two coomb of ſhorts	0	4	8
27.	For one hundred and twenty buſhels of turnips, and five buſhels of cabbages; ſay one hundred and twenty-five buſhels of turnips	0	6	0
	N. B. My crop of turnips this year produced eight buſhels per rod (their root and top cut off:) one hundred and twenty-five buſhels is therefore ſixteen rods, which, at two pounds two ſhillings per acre, the price this year comes to four ſhillings; but I have ſaid ſix ſhillings.			
27.	A man boiling turnips	0	0	9
	For five buſhels of coals, at three times	0	5	5
March 2.	For ten coomb of drains	0	6	8
	Expences	0	0	6
	For one coomb of ſhorts	0	2	4
6.	Ditto	0	2	2
8.	A man boiling	0	1	0
	Coals	0	2	0
		13	12	2
	Three months feed in clover	0	12	0
		14	4	2

PRODUCE.

			l.	s.	d.
Aug. 22.	Sold eleven pigs, lean, for		5	15	0
Nov. 12.	Sold nine lean		13	3	0
Mar. 25.	Value of ſtock carried to next year (the old ſow excepted) viz. the young ſow (one of the ten) with ſix pigs	2 12 6			
	Twelve pigs	5 8 0			
	A little ſow with pig, (bought May 19.)	1 5 0			
	The boar	1 1 0			
			10	6	6
			28	4	6
	Expences		14	4	0
	Profit		14	0	6

Before I make any obſervations on this account, I ſhall explain the price I charge for clover-feed.

I am enabled to do it very clearly this year, as I had none of my own, but hired a field of two acres and three rood, at one pound thirteen ſhillings per acre, from May to Michaelmas. I hired it purpoſely for my horſes, but kept the ten hogs in it for three months.

The price of the clover was four pounds ten ſhillings and ſixpence. The cattle it fed were

Five horſes, three months;
Ten hogs, three months;
Thirty-eight ſheep and lambs, one month;
Two heifers, two months.

The common price of joiſting a horſe is one ſhilling and ſixpence per week in clover; but that I may raiſe the price for the hogs, I will reckon the reſt of the cattle as low as poſſible.

	l.	s.	d.
Five horſes, ſay at three ſhillings and ſixpence per week, for three months	2	2	0
Thirty-eight ſheep and lambs, at two-pence per couple, for one month	1	5	4
Two heifers, at three-pence per week each, for two months	0	8	0
The hogs	0	12	0
	4	7	4

This

This comes as near the truth as any calculation I can make; and I can every year, by hiring clover, keep my hogs as cheap as this, without any affiſtance from arable land of my own. *Muſeum Ruſticum, vol.* IV. *p.* 274.

In a later number of the above work, another correſpondent makes the following remarks.

	l.	*s.*	*d.*
Eleven acres and a half, at fifteen ſhillings per acre, is - - - - - - - - - -	8	12	6
Eight acres and a half of after-graſs, at ſeven ſhillings and ſixpence per acre, for the remainder of the year after being mowed -	3	3	9
	11	16	3
Deduct for the ewes winter-feed, (for ſeventeen, the average in the nine years) at four ſhillings per head - - - - - - - -	3	8	0
To be charged to the annual expence of four cows - - - - - - - - - - - - - -	8	8	3
Expences attending the winter-feed of the ſaid four cows, as it does not appear any part thereof grew on the twenty acres; the average of two years is - - - -	5	0	$7\frac{1}{4}$
One year's expence attending four cows, per his own accounts - - - - - - - -	13	8	$10\frac{1}{4}$
The produce, per ſame accounts, on an average of two years, (making the proper allowance, and three-pence wrong in adding up) is - - - - - - - - - - - -	22	12	$2\frac{1}{2}$
Nett profit on four cows for one year, by his own account - - - - - - - -	9	3	$4\frac{1}{4}$
Thus it appears, admitting his accounts of expences to be for two years. But notwithſtanding the appearance theſe two ſums of four pounds ſix ſhillings and fourpence, and five pounds fourteen ſhillings and ten-pence halfpenny, have of being the expence attending four cows two winters, yet I think, that from April, 1763, to May 6, 1764, includes but one; and in which time it may be reaſonable to apprehend the hay and ſtraw therein mentioned were conſumed for fodder, (except the two hundred weight of hay in the firſt *item*, which, it is very probable, completed the feed of the preceding winter) as it does not appear any remained in ſtock; and that the one pound ten ſhillings, charged for firing, was alſo uſed in that time: therefore, if the firſt article of eight pounds ten ſhillings, and the two laſt, amounting to fifteen ſhillings and one halfpenny, in the expences of 1764, be rejected, all the others, which are divided into two experiments, may very juſtly be looked on to be but one year's expence, and amount to - - - - - - - -	8	12	4
Which being added to the rent - - -	8	8	3
Makes the expence attending four cows one year, excluſive of labour - - - - -	17	0	7
Deduct this from the average produce on two years, amounting to - - - - -	22	12	$2\frac{1}{2}$
Nett profit on four cows for one year is -	5	11	$7\frac{1}{2}$

which is one pound ſix ſhillings and ſeven-pence three farthings per cow per annum, the whey and butter-milk excepted, which, from a cow, can be no great quantity; for, in the account of produce, I obſerve, that the cheeſe, in the year 1763, was ſold for two-pence halfpenny per pound, and in 1764, for two-pence halfpenny, and ſome for two-pence per pound, a price in thoſe years (the ſcarcity of the article conſidered) which indicates it to be not of the beſt ſort, but what is with us called cowherd-milk cheeſe, that is, the night's milk ſkimmed (fleeted), and the morning's milk freſh from the cow, mixed together, and from which method nothing could be for the pigs from it but whey, and what butter-milk came from the cream of half the milk, which amounts to very little from four cows only; therefore the profits ariſing from pigs ſeem evidently to be from ſomething elſe beſide the paſture-land only, as neither grains (drains) peaſe, barley, gurgins (ſhorts) bran, oats, turnips, cabbages, or clover, grew thereon, and all of which, it appears from the accounts, were made uſe of in feeding the pigs. *Muſeum Ruſticum, vol.* IV. *page* 400.

DAISY, the greater, or *ox-eye*, by ſome called *maudlin-wort*, is the name of a perennial weed common in paſtures. The leaves are jagged, and embrace the ſtalk. The flowers are large, and radiated. The ray is white, and the diſh yellow: the ſeeds have no down.

DALLOP, a tuft, or clump.

DAM, a mole, or bank to confine water.

DAMSON, a ſmall black plum, brought originally from Damaſcus; whence the name.

DANDELION, the name of a very troubleſome and well-known weed in the meadows; and which will ſpread greatly, if the flowers are ſuffered to perfect their ſeeds, which are light, downy, and of courſe eaſily blown about by the wind.

DANEWORK, a name given in ſome counties to that ſpecies of elder, generally called dwarf-elder, or wall-wort.

DANK, damp, humid, moiſt, wet.

DAPPLE, marked with various colours.

DARNEL *See* COCKLE.

Annual DARNEL-GRASS, called *white darnel* by Gerrard, and in the ſouthern counties *crap*. This plant is ſo much like the *red darnel-graſs*, that it has been greatly cultivated under the name of *ray-graſs*, or vulgarly *rie-graſs*; but the ſpike is much longer and paler; and has beards, which the ray-graſs is entirely without. It is likewiſe annual; whereas the ray-graſs has an abiding root. Its ſeeds ripen with the corn. *See* Plate VII. Fig. 1.

DAWN, the time when the light of the morning firſt appears.

DAY-BREAK, the dawn, the firſt appearance of light.

DAY-WORK, work impoſed by the day. Day-labour.

DEARTH, ſcarcity; a time when food is dear.

DEATH-WATCH, the name of an inſect that makes a ticking noiſe, ſuperſtitiouſly imagined to prognoſticate death.

DECEMBER, the laſt month of the year.

The earth is now commonly locked up under its frozen coat, ſo that the huſbandman has leiſure to ſit and ſpend what ſtore he has before-hand provided.

Now is the time to houſe old cattle, and to fell all ſorts of timber, and other trees, for building, or utenſils; to cut coppices, &c.

Let horſes blood, fatten ſwine, and kill them. Deſtroy ant-hills.

Plough up your land that you deſign for beans, provided it be not frozen too hard; drain corn fields, where the water ſtagnates, and overflow, or water your meadows.

Put your ſheep and ſwine to the peaſe-rick, and fatten them for the market. Cut hedges, and lop trees. *Mortimer's Huſbandry, vol.* II. *p.* 448.

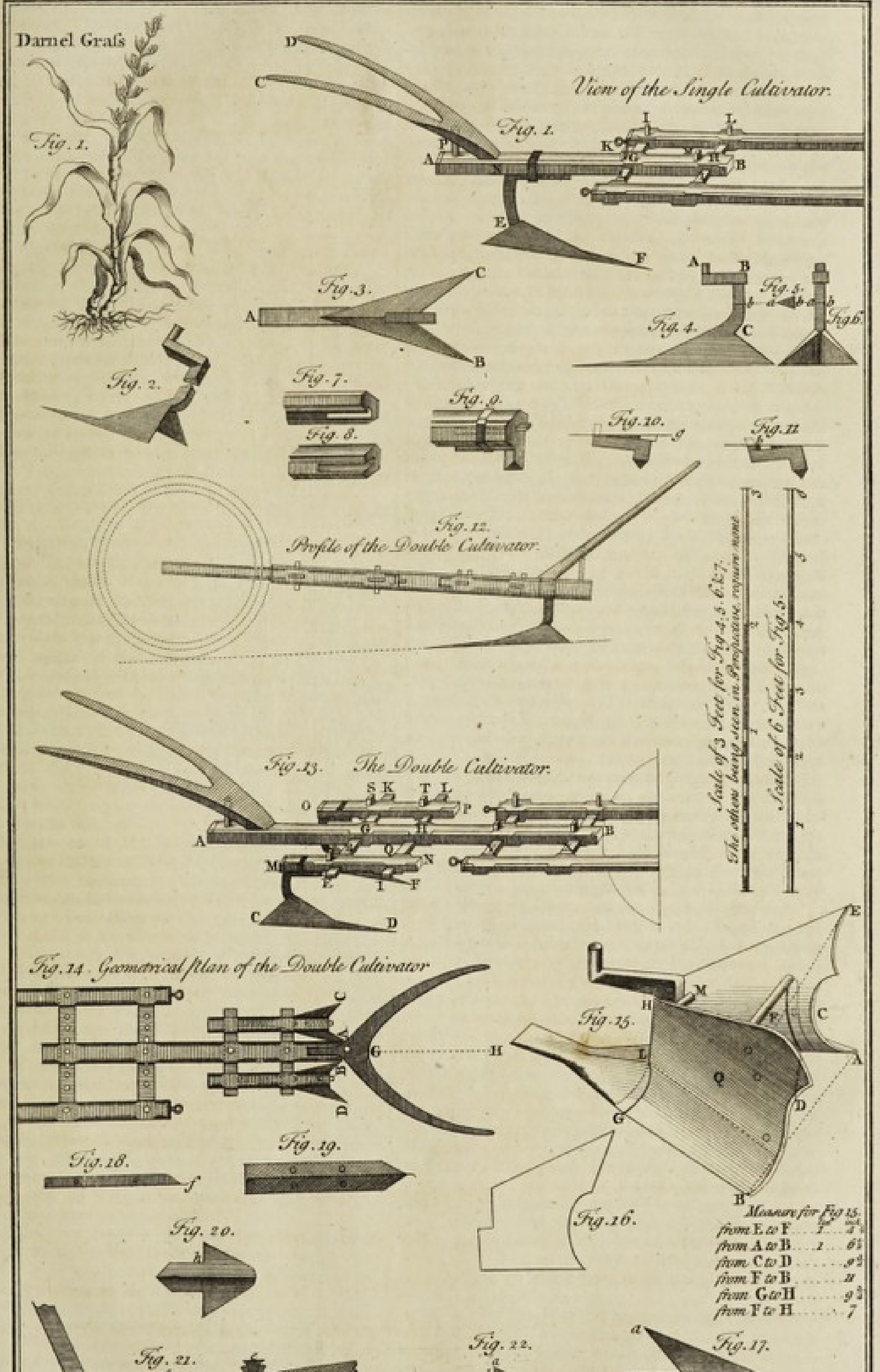
DECIDUOUS, falling, not perennial: an epithet applied to ſuch trees and ſhrubs as ſhed their leaves in the autumn. Thus the oak, the elm, the beech, &c. are called deciduous trees.

DECLIVITY, inclination or declivity, reckoned downwards; gradual deſcent.

DEFICATION, the act of purifying any liquor from its lees or foulneſs.

DELVING, digging, or the act of turning up the earth with a ſpade.

DEMAIN, or *demeſne*, the land which a man holds originally of himſelf. It is alſo ſometimes uſed as a diſtinction between thoſe lands which the lord of the manor hath in his own hands, or in the hands of his leſſee, and ſuch other lands appertaining to the ſaid manor, as belong to free or copy-holders.


Darnel Grafs
Fig. 1.
View of the Single Cultivator.
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Profile of the Double Cultivator.
Scale of 3 Feet for Fig. 4. 5. 6. & 7.
The others being seen in Perspective require none.
Scale of 6 Feet for Fig. 5.
Fig. 13. The Double Cultivator.
Fig. 14. Geometrical plan of the Double Cultivator
Fig. 15.
Fig. 16.
Fig. 17.
Fig. 18.
Fig. 19.
Fig. 20.
Fig. 21.
Fig. 22.
Measure for Fig. 15.
from E to F 1 4
from A to B 1 6½
from C to D 9½
from F to B 11
from G to H 9½
from F to H 7
J. Hulett sculp.

DENSHIRING. *See the article* BURN-BAKING.

DEVIL *in a bush*, or *fennel-flower*, a very troublesome weed among the corn, especially in Italy, France, and Germany, where it abounds much more than in this country. It rises with slender stalks, near a foot high, which sometimes branch out at the bottom, and sometimes are single, garnished with a few very fine cut leaves, somewhat like those of dill. Its flower is generally blue, and its seeds are rough and black. This, together with their being nearly of the same size as the grains of wheat, renders it difficult to separate them from the corn, when the plant has been cut and housed with it; they blacken the meal, and debase its value. The plant is annual, and therefore may be extirpated by rooting it out before it can seed, which is commonly in August.

DEVIL's-BIT, the name of a weed often found among the corn, but more frequently in meadows. It has a strong, thick, fibrous, perennial root, which runs deep into the ground, and sends out several branching stalks, which rise near three feet high. The lower leaves are sometimes almost entire, and at others they are cut into many segments almost to the mid-rib: they are seven or eight inches long, and from three to four broad in the middle, hairy, and sit close to the root. The stalks are covered with stiff, prickly hairs, and garnished with smaller leaves at each joint. The flowers, which are of a pale purple colour, and have a faint odour, appear in June, upon naked foot-stalks at the end of the branches, which decay to the root every autumn.

DEVIL's-GUTS, the same with the lesser bind-weed. *See the article* BIND-WEED.

DEVONSHIRING. *See the article* BURN-BAKING.

DEW, the moisture perceived on the ground, and on the leaves of plants, blades of grass, &c. in the morning.

Those who have made no other reflections on dew than such as present themselves naturally, think that all the moisture one finds in the morning on plants and upon the ground, comes in reality from above; but, when the affair is examined with more attention, one sees that at least a great part of the dew arises from the earth itself and the plants, and keeps hanging to their surface. Mr. Gersten, who hath made a dissertation on this subject in particular, hath even thought that there fell no dew from above on the ground, and that all which we see under the form of dew arose from the earth or plants, on which it keeps hanging in pearls, till the heat of the day hath dispersed it.

This opinion of Mr. Gersten was not new, and we find, in the History of the Academy for 1687, that some persons of the company had advanced, that the dew rose from the earth, and did not descend from above, because they found under glass-bells as much dew as in other places exposed to the air: it is probable, that since that time several persons have been of the same sentiment; one finds even traces of it in ancient authors: but Mr. Gersten did not derive his notion from thence; he had given, in the work which we have cited, a new explication of the risings and fallings of the barometer that did not agree with the descent of dew; this made him think of examining the thing with more attention than had hitherto been done. He had already observed in gardens that the grass was full of a moisture in the evening, and covered with very perceptible little drops, whilst the leaves of trees, and plants that were more raised from the ground, had not the least appearance of it; he remarked moreover, that all the plants had it not equally, that on some it was very abundant, whilst he could scarce perceive it on others.

We shall not relate a great number of experiments that were made by Mr. Gresten, although some of them are extremely curious; but the reader will see by those which we shall give an account of afterwards, that it was necessary, in order to draw certain and exact consequences, to have a knowledge of several facts, the discovery of which was reserved for Mr. Musschenbroek; who after having verified the greatest part of Mr. Gersten's experiments, at first submitted himself to his opinion, but he hath since changed, and is fixed in acknowledging several sorts of dews, of which one more dense than all the others rises from lakes, rivers, and marshes.

And a third falls from above: Mr. Musschenbroek founds the existence of this last on a great number of experiments, which he hath made upon the leaden terras of the observatory at Utrecht; it was not possible that any vapour should rise from this terras of lead, yet several bodies which he exposed there received dew on their upper surface; from whence Mr. Musschenbroek concludes that there is really a dew that falls.

" Several observations and experiments repeated very often, and which always proved uniform, leave no longer any doubt with me concerning the nature of dew, at least with regard to its rising or falling; and I think one may be satisfied that it rises only from the earth and plants; that this moisture, or this vapour, consists of an infinite number of little aqueous globules extremely light with which the air is loaded, and which it carries with it whithersoever it is driven by its fluctuating motion: thus the bodies which are met by this aqueous vapour, receive it in all the parts of their surface, and are immersed all at once. In the experiments of Mr. Musschenbroek where bodies exposed on the leaden terras received dew on their upper surface, it is true, the moisture did not come from the terras, but it rose from the earth, and from the plants round about; it came successively, and by the vehicle of air to the terras of lead; it was afterwards diffused through all the air that was above this terras, and fastened to the bodies which were exposed to receive it: if Mr. Musschenbroek had attended to the time when the dew began to be perceived on the terras, he would have remarked, that it was sensible a long time before at the foot of the tower, on whose summit he made the observation; I even doubt not but, if he had raised a mirrour or piece of glass to six feet above the leaden terras, he would have found drops of dew attached to the inferior surface of the glass, as soon and in as great quantities as on the superior surface: this I cannot doubt of from experiments I have made along the different heights of the steps of a ladder. I placed two ladders opposite each other, joined at their tops, spreading wide asunder at their bottoms, and so high as to reach thirty-two feet. To the several steps of these I fastened large squares of glass, and set them in such a manner that they should not shade or hang over one another. It was plain that, if the dew descended without first rising, the top squares must be first wetted, and that on their upper surface; but on the contrary, if the dew first ascended from the earth, the bottom surfaces of the lower panes must first receive it: and thus in fact it happened; the lower surface of the lowest piece of glass was first wetted, then its upper surface; then the lower surface of the pane next above it, and so on gradually till the whole was wetted to the top of the ladders.

" But, in order to assure myself more certainly, and leave no room for doubt on this subject, I have lately repeated the same experiments at Paris upon a leaden terras. I suspended a glass upon a wooden frame, raised only two feet, and I constantly found drops of dew pretty nearly in equal quantity on the under side as on the upper side of the glass; which is different from the former experiments that were made in the country, where the inferior surface was always sooner and more abundantly moistened than the superior; but the reason of this difference is very evident, for in the country the aqueous vapours rose directly from the earth, and fastened themselves to the under surface of the glass; but it is not so on a terras of lead, and surrounded by lofty buildings: in this case, the air that is loaded with moist vapours cannot arrive thither but by long windings, and a very irregular fluctuation; so that there is no more reason why it should fasten itself to the under than to the upper side of the glass; or, in other words, the vapour doth not rise there perpendicularly as in the country, but is driven in a lateral direction.

" Notwithstanding all I have been saying, I do not pretend that there is but one kind of dew, and deny not but there may be a dew whose parts are gross enough, and have sufficient weight to fall to the ground; yet I think in that case it would be visible, and form what we know by the name of fog: but our inquiry is at present of that kind of dew, so stiled by all, which is imperceptible to the eyes, and becomes sensible only by wetting thofe bodies that are expofed to the air in the night." *Mem. Acad. Roy. Sciences.*

The reverend Dr. Hales, in his treatife of Vegetable Statics, tells us, that in order to find out the quantity of dew that fell in the night, on the 15th of Auguft, at 7. p. m. he took two glazed earthen pans, which were three inches deep, and twelve inches diameter in furface; that he filled them with pretty moift earth, taken from off the furface of the ground, and they increafed in weight by the night's dew 180 grains; and decreafed in weight by the evaporation of the day one ounce + 282 grains.

He fays likewife, he fet thefe in other broader pans to prevent any moifture from the earth fticking to the bottom of them. He adds, the moifter the earth is, the more dew falls on it in a night, and more than a double quantity of dew falls on a furface of water than there does on an equal furface of moift earth: the evaporation of a furface of water in nine hours winter's dry day, is $\frac{1}{31}$ of an inch: the evaporation of a furface of ice, fet in the fhade during a nine hours day, was $\frac{1}{41}$. So here are 540 grains more evaporated from the earth every twenty-four hours in fummer, than fall in dew in the night; that is, in twenty-one days near twenty-fix ounces from a circular area of a foot diameter; and circles being as the fquares of their diameters, ten pounds + two ounces will in twenty-one days be evaporated from the hemifphere of thirty inches diameter, which the funflower's root occupies; which, with the twenty-nine pounds drawn off by the plant in the fame time, makes thirty-nine pounds, that is, nine pounds and three-fourths out of every cubic foot of earth, the plant's roots occupying more than four cubic feet: but this is a much greater degree of drynefs than the furface of the earth ever fuffers for fifteen inches deep, even in the drieft feafons in this country.

In a long dry feafon therefore, efpecially between the tropics, we muft have recourfe, for fufficient moifture to keep plants and trees alive, to the moift ftrata of earth, which lie next below that in which the roots are.

Now, moift bodies always communicate of their moifture to more dry adjoining bodies; but this flow motion of the afcent of moifture is much accelerated by the fun's heat to confiderable depths in the earth, as is probable, he fays, from the twentieth experiment in the faid book.

Now, 180 grains of dew falling in one night, on a circle of a foot diameter = 113 fquare inches; thefe 180 grains being equally fpread on this furface, its depth will be $\frac{1}{159}$ part of an inch $= \frac{180}{113 + 254}$. He adds, that he found the dew in a winter's night to be the $\frac{1}{90}$ part of an inch; fo that if we allow 151 nights for the extent of the fummer's dew, it will in that time arife to one inch deep: and, reckoning the remaining 214 nights for the extent of the winter's dew, it will produce two, thirty-nine inches deep; which makes the dew of the whole year amount to three, thirty-nine inches deep.

And the quantity which evaporated in a fair fummer's day from the fame furface, being as one ounce 282 grains, gives $\frac{1}{40}$ part of an inch deep for evaporation, which is four times as much as fell at night.

He fays likewife, that he found, by the fame means, the evaporation of a winter's day to be nearly the fame as in a fummer's day; for, the earth being in winter more faturated with moifture, that excefs of moifture anfwers to the exceffive heat in fummer.

It is very certain, that fubftances of a very different kind from the ufual and natural matter of the dew, have fometimes fallen in that form. Our Philofophical Tranfactions give an account, that, in the year 1695, there fell in Ireland, in feveral parts of the provinces of Leinfter and Munfter, for a confiderable part of the winter and fpring, a fatty fubftance refembling butter, inftead of the common dew; it was of a clammy texture and dark-yellow colour; and was, from its great refemblance, generally called dew-butter by the country people. It always fell in the night, and chiefly in the moorifh low grounds, and was found hanging on the tops of the grafs, and on the thatch of the houfes of the poor people. It was feldom obferved to fall twice in the fame place, and ufually, wherever it fell, it lay a fortnight upon the ground before it changed colour, but, after that, it gradually dried up, and became black. The cattle fed in the fields where it lay, as well as in others, and received no hurt from it: it fell in pieces of the bignefs of one's finger end, but they were difperfed fcatteringly about, and it had an offenfive fmell, like that of a church-yard. There were, in the fame places, very ftinking fogs during the winter, and fome people fuppofe this no other than a fediment or connection of the heavier matter of thofe fogs. It would not keep very long, but it never bred worms. The country people, willing to have fome good of it, tried it on their children's foreheads, and it always cured them of a fcald-head. *Phil. Tranf.* N° 220.

For the nature and properties of dew, with regard to vegetation, *fee the article* ATMOSPHERE.

DEWLAP, the flefh that hangs down from the throat of oxen.

DIABETES, a morbid copioufnefs of urine, or the making water in too great quantities. This diforder is very common in horfes, and often terminates in death.

Horfes fubject to a diabetes, or profufe ftaling, if old, or of a weak conftitution, are feldom cured; they foon lofe their flefh and appetite, grow feeble, their coat ftaring, and they die rotten. Of a young horfe there are more hopes; but he muft not be indulged with too much water, or moift food. At the fame time give him the following drink:

> Take jefuit's bark, four ounces; biftort and tormentil-root, of each two ounces: boil them in two gallons of lime-water to the confumption of half, and give a pint three times a day.

Let the horfe drink two or three quarts a day of lime-water; and if thefe medicines fhould not fucceed, give a quart of ftrong alum-poffet, three or four times a day.

This method is proper alfo for a horfe who ftales blood; or the following balls may be given for that purpofe, if the bleeding is profufe:

> Take bole armoniac one ounce, Japan earth half an ounce, roch alum two drams, elixir of vitriol one dram; make them into a ball with conferve of rofes, and give it every fix hours.

As this diforder generally proceeds from too violent exercife, over-ftraining, &c. repeated bleedings in fmall quantities are abfolutely neceffary, till the mouths of the veffels clofe up. *Bartlet's Farriery, p.* 165.

DIAPHRAGM, midriff, or fkirt, as fome call it in a horfe or bullock, is a mufcular fubftance that divides the upper cavity or cheft from the lower belly.

DIBBLE, a fetting-ftick, or inftrument to make holes in the ground, for fetting plants, &c.

DIG, a mattock. *See* MATTOCK.

DIGGING, the act of turning up the earth with a fpade.

Was labour confiderably cheaper in England than it is at prefent, and a fufficient number of hands could be found, it would doubtlefs be the beft way to dig by hand all the ground deftined for potatoes, carrots, lucern, &c. many advantages would accrue from this method of tillage; the earth would be loofened to a greater depth, and much better pulverifed; nor would the weeds and grafs be fo apt to grow as in ploughed lands.

DIGITATED, branched out into divifions like fingers.

DIKE, a ditch. It alfo fignifies a dam or mound to hinder inundations.

DILL, the name of an herb cultivated in the kitchen-garden, and nearly refembling fennel.

Dill muft be fown where it is to remain, for it will not bear tranfplanting. The foil fhould be light, and the feeds fown in the autumn, foon after they are ripe; for they feldom grow well if they are kept out of the ground till fpring. When the plants are come up, they fhould be thinned to the diftance of eight or ten inches from each other, that they may have room to put forth their lateral branches; and if they are afterwards kept clear from weeds by good hoeing, they will not require

any

any farther care. When their feeds begin to be formed, fuch of the pods as are intended to be put into pickle for cucumbers (for that is their chief culinary ufe) fhould be cut; and when the feeds of the remainder deftined for fowing are ripe, they fhould be dried upon a cloth, and then beaten out. If they are fuffered to fow themfelves, they will produce in the fpring a multitude of young plants, which will want no other culture than thinning them with a hoe, and keeping them free from weeds.

DINGLE, a fmall clough or valley between two fteep hills.

DITCH, a trench cut in the ground, ufually round the fences of a field.

The mud of ditches affords an excellent manure, as it confifts of the putrid particles of animals and vegetables, mixed with the fineft and richeft mould; and therefore proves a great improvement to any foil, particularly the light and dry. But this mud fhould be expofed to the air for fome time, that the feeds of the weeds generally contained in it may have time to vegetate or putrify, before it be laid on the land.

DOCK, the name of a weed, of which there are feveral fpecies, and all of them remarkable for the largenefs of their leaves; fo that he muft be a very flovenly farmer who fuffers any of thefe plants to grow large. They fhould be plucked up by the roots as foon as they appear, which may be eafily done, as the roots are of the tap, or carrot kind.

DOCKING, the act of cutting off the tails of horfes.

This operation is in general very fuccefsfully executed by the common methods, which are known to every farrier. But fometimes a mifcarriage enfues by an inflammation and gangrene fucceeding. Thefe accidents probably arife from the tendons of the tail fuffering by an injudicious application of the knife or fearing-iron, or in an improper feafon for the operation. Neither the very hot or cold months are proper, for reafons fufficiently obvious. The operation fhould always be performed by incifion, or the chopping engine: the knife being paffed through the tail from above, whilft it lays on the block; for when the cutting inftrument is applied underneath, the blow is given on the tail, which, by bruifing the tendons, may be naturally fufpected to occafion bad fymptoms. The fearing-iron fhould be fmooth, and better polifhed than thofe generally ufed, and ought to be rubbed clean on a woollen-cloth, before it be applied to the ftump; otherwife the fparks, which fly from the iron, are apt to occafion great pain, attended with the fwelling both of the fheath and fundament: nor fhould it ever be applied flaming hot, for then it brings the burnt part away with it, and requires a re-application, in order to form a frefh efchar on the veffels; by which means the bone is frequently left too much expofed, fo that it is often a confiderable time before it is covered.

Farriers feldom apply any thing to the ftump; which need only be anointed with the wound ointment, and when the efchar is digefted off, may be wafhed with allum or lime-water: but if an inflammation enfues, with a difcharge of thin matter, a proper digeftive, compofed of Venice-turpentine, rubbed with the yolk of an egg and tincture of myrrh, fhould be applied, with a poultice of bread and milk over it. The rump fhould be frequently bathed with oil of rofes and vinegar, and a large quantity of blood taken away. If the fundament be at all fwelled, and the inflammation at all fufpected to be communicated to the bowels, let cooling emollient clyfters be injected two or three times a day. Should a gangrene enfue, add Ægyptiacum to your dreffings, and fpirits to the fomentation: and apply over all the ftrong-beer poultice, with London treacle, twice a day. *Bartlet's Farriery, pag.* 323.

DODDED *Sheep*, fheep without horns.

DODDER, the name of fo remarkable a plant, that it cannot eafily be miftaken. It is entirely without leaves, and does not depend upon the ground for nourifhment; but when it is grown up, rots at the bottom, and lives upon the juices of other plants about which it entwines itfelf, by means of threads of a red colour, which it throws out. The flowers are fmall, and come out in roundifh heads or bunches, many of them together, here and there, from the ftem.

DODMAN, a name given in fome of the northern counties to the fhell-fnail.

DODRED *Wheat*, red wheat without beards.

DOG's *Grafs*. *See* COUCH-GRASS.

DOKE, a deep furrow.

DOLE, or *Dool*, a long narrow green in an arable field, left unploughed.

DOLPHIN-*Fly*, the name of an infect very deftructive to beans. *See the article* BEANS.

DOOL, the fame with dole. *See* DOLE.

DOSOME, an epithet appplied to fuch beafts as improve apace. Thus a thriving beaft is called, in the northern counties, a dofome beaft.

DRAGS, a name given in fome counties to the heavieft pair of ox-harrows.

DRAFFE, the grains of malt.

DRAIN, a channel, or trench, cut in the earth, in order to carry, or drain off the water. *See the articles* BOG, MARSH, and MOOR.

When coarfe grafs is produced, the ground is evidently over-charged with moifture, proceeding either from cold, hungry fprings, loaded with fome mineral or acid, which want vent; or elfe from external floods, which, being confined by a ftiff clay, impervious to water, remain upon it, and corrupt the natural nourifhment proper for producing the fweet and richer graffes. When this laft is the cafe, the remedy is eafy, by making proper drains to carry off the fuperfluous moifture. But if the land be fpouty or fpewy, as it is commonly termed, and the moifture arifes from fprings, a deep drain muft be cut in the loweft part, and fmaller drains from that principal ditch to fuch places as appear to be the heads of the fprings, which will be known by their being wetter and loofer than other parts. The drains muft be cut deep enough to reach the bed, whether gravel or fand, through which the water flows; and upon the firft touching of this, the water will be found to run off more freely, and in greater quantity.

The fmaller drains, communicating with the main ditch, fhould be left open for fome time, until the quantity of moifture abate. After this, to make them covered drains, by which the furface is rendered level, and no part of it is loft, they fhould be filled up with fmall ftones to within about a foot and a half of the furface, and then covered with turf, the green fide downward, or with heath, broom, ftraw, or any other thing that can moft conveniently be had, proper to keep the earth from falling in among the chinks of the ftones, through which, if no fuch accident happen, the water will pafs eafily, the drains will prove effectual, and the plough, after the earth that was turned out is laid above all, will go freely over, without being oppofed by the ftones. A foot depth of mould over the drain will be fufficient in pafture-grounds; but this covering fhould be at leaft a foot and a half thick in ploughed lands. Where ftones are fcarce, faggots made of the branches of any kind of trees are fubftituted in their place: but they do not anfwer the purpofe fo well, becaufe they decay and rot, the earth falls in, and the drains are ftopped: though it is highly proper, where thefe are ufed, to line the fides of the drains with brick or ftone, without mortar, to keep the earth from falling in there, and at the fame time give free admittance to the water. It muft be obferved, that, where a great quantity of water is to be difcharged, the main drain into which the fmaller drains are to empty themfelves, fhould not by any means be filled up, even with ftones, unlefs it be both very deep and very wide, and there be a great quantity of ftones to throw into it, left it fhould not be able to difcharge all the water; in which cafe the whole work will prove worfe than ufelefs; a remedy being very difficult on account of the ftones.

The beft time for covering thefe drains is about Michaelmas; becaufe the earth is drieft at that feafon, before the winter rains begin to fall. The digging of them is indeed very laborious work, particularly in marfhes, the foil of which is always of a tough, ftrong quality. It is therefore of great importance, that every means be ufed to leffen that fatiguing labour. The fhovels and ſpades univerſally uſed, are certainly too ſhort. Their length ſhould be ſuch as to give the labourer every advantage ariſing from his own ſtrength. In order to have this, he ſhould ſtand as erect as poſſible: for otherwiſe, he has not only the weight of the earth on the ſpade or ſhovel to raiſe, but alſo that of his own body; whereas, if the ſhovel be of a due length, an eaſy ſhifting of the lower-moſt hand becomes a prop, or point, on which the weight at the end is raiſed, almoſt without bending the body.

Where the ground in which the ſprings are lies on a gentle declivity, Mr. Tull very properly adviſes ploughing it nearly horizontally, by which means each furrow carries off the water, which would otherwiſe ſink into the next ridge. If the clay underneath be at ſo ſmall a depth that the plough can reach it, this will have a very good effect: and as the nearly horizontal direction of the furrow gives the water but a ſlow motion, it will not be ſo apt to waſh away the richer mould, as it would if the furrows were more perpendicular to the declivity. Theſe furrows ſhould, however, have ſlope enough to give the water a current ſufficient to prevent its ſoaking into the ridge underneath.

If the ſprings riſe only at the bottom of a ſloping ground, one large drain, reaching the whole length of the declivity, and cut down to the bed of clay underneath, may be ſufficient, with the help of a channel to carry off the water.

If there is any mineral in the earth, eſpecially a chalybeate, which Dr. Home has experienced to be very prejudicial to vegetation, ſuch mineral, being waſhed out by the ſprings, is lodged in the ſoil, towards the ſurface.

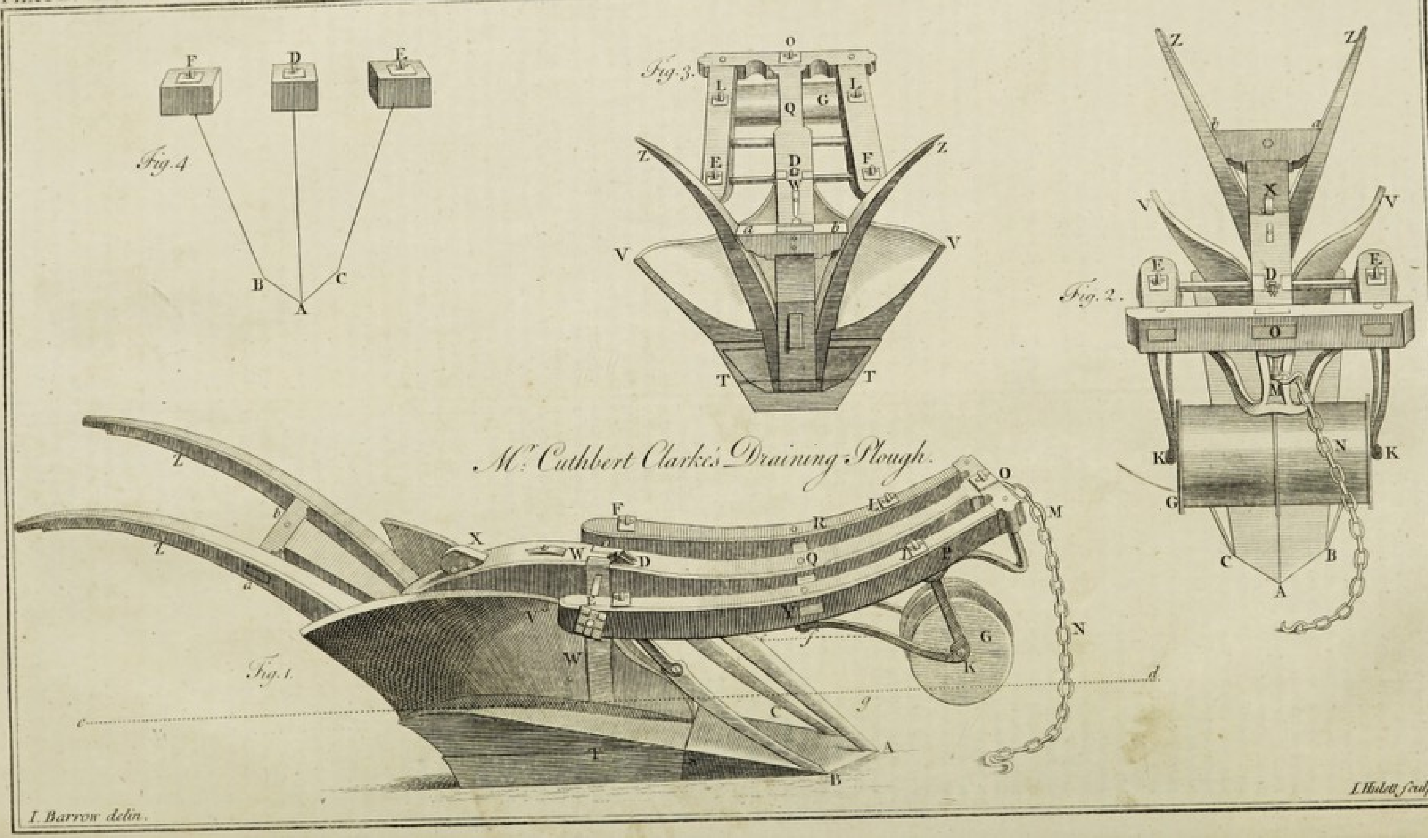
DRAINING *of Land*, the operation of carrying off the water from wet lands. *See the articles* BOG, MARSH, and MOOR.

A correſpondent of the editors of the Muſeum Ruſticum has obliged the public with the following obſervations on the uſes of draining.

" The firſt experiment, ſays he, I made, was upon a piece of ground of about four or five acres, in the front of my houſe, of the ſpringy kind; where the waters, collected from the rains and dews in a large plain of dry land above, broke out upon the declivity of the hill; and not having proper drains and channels, to carry them away, had, by long overflowing, rendered the ground ſo ſoft and boggy, as not to allow the tread of any ſort of cattle, (unleſs in very ſevere froſts;) and thereby made it intirely uſeleſs, and alſo very diſagreeable to the eye. I took the opportunity of a very hard and laſting froſt, to carry on a large quantity of ſtones for making the intended drains: which were laid out in the following manner. A main drain, or trench, was made through the middle of the ground, from a ſmall rivulet (into which it was to empty itſelf), to a little above where the ſprings made their firſt appearance: from thence two drains (one on each ſide) were carried along the ſide of a hill to the two extreme parts of the ground, emptying themſelves into the head of the firſt mentioned drain, which was only made about three feet deep till near the top of it. The branches or ſide drains were better than ſix feet, as I hoped thereby to have cut off all the ſprings: but the declivity of the land being conſiderable, I was obliged to add two drains more below: as ſome of the ſprings had eſcaped under the bottoms of the higheſt branches. I made the drains in the following manner. The bottoms were flagged with a thin tender ſtone (of no other uſe;) the ſides walled with rubbiſh ſtone (the walls being about five inches aſunder, and five inches high;) and the tops covered with a ſtronger kind of rubbiſh ſtone. Upon the covers, I laid ruſhes and reeds, (the then only produce of the ground) to prevent any dirt or ſoil from getting through the openings of them into the drains; and, laſtly, I filled them up with the moſt porous ſubſtances, dug out to near the height of the ſurface.

" I began this work about the end of March, and had finiſhed it about the end of Auguſt. I very ſoon found the good effects of my labour, the ground being grown ſo hard and ſolid before the middle of October, that I was able to carry on, with carts, a very large heap of compoſt, which I had prepared ready for that purpoſe; conſiſting of freſh litter from the ſtables, virgin earth, ſtreet dirt, coal-aſhes, and lime, well incorporated together by frequent turnings. The next ſummer moſt agreeably ſurpriſed me with as fine a crop of hay, both in reſpect of quantity and quality, as any of the neighbouring grounds could boaſt, (above three loads to the acre:) and the aftermath, or ſecond crop, was full as extraordinary as the firſt. In order to know the profit of the latter exactly, I hurdled it off in ſmall parcels: and, having taken in cattle by the week, found the profit better than twenty ſhillings a ſtatute acre. This ground has kept improving ever ſince; and now affords me three crops every year; viz. ſpring paſturage for my milch-cows and early feeders, a moſt plentiful crop of good hay, and an excellent aftermath; without having had any ſuperinduction beſtowed upon it ſince the firſt, which is eleven years ago. When ſtones cannot be conveniently had, the common flat tiles for the bottoms, and the common brick for the ſides, and covers of the drains, will do very well; and, as bricks are more expeditiouſly laid than the rubbiſh-ſtones, I think they will be full as cheap, if proper clay, and fuel for burning them, can be procured upon eaſy terms. The expence of draining this piece of ground was about five pounds per acre. I have drained many acres of the ſame kind of land ſince, with equal ſucceſs; and at a much leſs expence. Another kind of land, which has fallen within my practice of draining, is what I call the four ſpongy land; where there is upon the ſurface a tolerable good mould, for ſix or ſeven inches deep, and below that a ſtiff clay, that will not permit any water to paſs through it; by which means, the ſoil above is ſo ſoaked and chilled, with a conſtant ſurcharge of water, that it is not able to produce any thing but ruſhes, and all the worſt ſpecies of aquatic weeds. As this kind of land is often nearly level, or but gently declining, the firſt ſtep I take, is (by levelling) to find the greateſt fall I can get within any reaſonable diſtance. Then, by the means of iron-rods, (ſuch as are uſed in boring for coals) with a bitt or iron ſcoop at the bottom, I try in ſeveral places the depth of the clayey ſtratum, which ſo obſtructs the paſſage of the water; and alſo what the natures of the ſeveral ſtratums below it are, till I come as low as the level, where I propoſe to begin my drain. If I find, in ſuch ſearch gravel, ſand, ſoft-rock, pinnel, or other porous ſubſtance, I begin the good work immediately, and with full aſſurance of ſucceſs: making a good ſtone or brick drain (as before deſcribed) through the loweſt part of the ground intended to be drained; and then filling it up with all the light porous ſubſtances, that ariſe in the digging of it, or any rubbiſh that can be conveniently procured; taking great care that none of the clay, or hard ſubſtances, be thrown in again; and that the top and ſides of the drain be left lower than the reſt o. the land; that the winter rains may eaſily deſcend to it, and ſo paſs (as through a ſieve) into the channel prepared to receive them. If there be any low parts in the piece of ground, from whence the rain-water cannot deſcend to the main drain, ſmall pebble, or wood drains, ſhould be made from thoſe low parts into it: taking care to fill them up with ſome rubbiſh or light mould. The clay, which is dug out, may be converted (either by burning or laying up in heaps with quicklime) into a moſt excellent tillage, either for corn or graſs land, for the improvement of the ſame ground, or any other where it is more wanted. For the fertility of ſuch land, after ſuch draining, is greater than can be well imagined by thoſe who have not tried it, even without any further improvement. I generally (indeed) ſet on lime immediately afterwards, if the ſeaſon of the year be proper for it: which, I ſay (from experience), is from the middle of April, to the middle of July; being certain, (notwithſtanding ſome great authorities, and the common practice are againſt me) that twenty buſhels ſet upon graſs-land, during that ſeaſon, are more than equal to thirty laid on in the autumn, or winter ſeaſons. About an hundred and ſixty buſhels to an acre are a proper dreſſing. The laſt kind of land, of which I ſhall now treat, is the black peat or mooriſh land, many thouſand acres of which, in this kingdom, are now intirely uſeleſs, though capable of being

PLATE. VIII.


Mr. Cuthbert Clarke's Draining Plough.
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4
I. Barrow delin.
I. Hulett sculp.

being improved to great advantage. Nay, I will venture to affirm, that there is ſcarcely any ſo bad, but that it might, by proper means, and due induſtry, be converted to ſome uſeful purpoſe. For which aſſertion, I have a happy authority, in that beautiful teſtimonial of induſtry, given by Virgil, in his fourth Georgic, to the old Corycian farmer. If theſe kinds of land be nearly upon a level, I uſe the precautions mentioned in the laſt article; and, if I find my level will carry me below, or to the bottom of this black mooriſh or peat-earth, I do not regard the depth of my drains, as the digging is very eaſy, and what is thrown out will nearly pay the expence, by being either dried into peat for fuel, or burnt into aſhes; which, if properly managed, are an excellent dreſſing, either for ſpring-corn, or graſs-land. In the draining of this kind of ground, I make one principal drain through the middle of the piece, (of ſtone or bricks, as before mentioned); and, at about every eighty or a hundred yards, branches from it. Theſe I make rather better than two feet wide at the top; and continue them nearly of the ſame width, till within eight or nine inches of the bottom. Then, with a ſpade (about nine inches broad at the top, and narrowing down to three inches) I make a lower drain; and, upon the ſides or ledges (formed by the narrowing of it), lay large heath-ſods, cut ſquare, and exactly to the width of the upper part: by which means, a cavity is left for the water to run in. Upon thoſe ſods or covers, I throw bruſh-wood, or any kind of light trumpery: and, laſtly, I fill it up with the ſmalleſt of the black ſoil thrown out. Such is the preſerving nature of this black peat or earth, to all vegetables buried in it, that there is no doubt, but drains of this laſt kind will endure for ever, if they be laid deep enough. After the ground is drained and levelled, marl (if to be had near) ſhould be laid on; if not, ſand, gravel, or any kind of light earth. If the firſt, no other ſuperinduction will be required; but if any of the latter over it ſhould be ſpread, a cover of ſome of the fineſt black mould, that is pretty free from any ſtrings or fibres; and then a compoſt made of horſe-dung, coal-aſhes, earth, or clay and lime; and, laſtly, it ſhould be laid down either with graſs-ſeeds alone, or with barley (or oats) and graſs-ſeeds. I laid down a piece (drained and managed as above mentioned) about the beginning of Auguſt laſt, with white clover, yellow clover, and common hay-ſeeds, and though the ſeaſon was ſo remarkably dry and hot, yet the young plants came up very well, and very thick, and, in this preſent ſevere froſt, it affords a verdure, not to be ſeen any where elſe in the neighbourhood; and the piece is conſtantly covered by my cattle, tempted by the look, and the ſweet food it affords them. I am now preparing about five acres of the ſame kind of land, to be laid down with barley and graſs-ſeeds in the ſpring; and hope (if the ſeaſon proves favourable) to have a good crop of both. I had no marl (or even clay) near, ſo was obliged to make uſe of ſand and gravel for my firſt ſtratum.

DRAINING-PLOUGH, a plough for cutting drains, in order to carry off the water from wet ſoils.

Several inſtruments have been invented for performing this neceſſary operation; but as none were found ſufficient to anſwer the intention of the huſbandman, the Society for the Encouragement of Arts, Manufactures, and Commerce, propoſed a premium of fifty guineas for the beſt plough or machine, of the ſimpleſt conſtruction, that ſhould, with the leaſt force, cut a new drain one foot in depth perpendicular, one foot eight inches wide at the top, and ten inches at bottom; both ſides of the drain equally ſlooping, and the earth to be equally thrown out on both ſides. In conſequence of this premium, ſeveral inſtruments for effecting this purpoſe were ſent in to the Society; but upon trial one was found much ſuperior to the reſt, and anſwerable to the Society's advertiſement: and in conſequence of which the premium was adjudged to the author.

This plough, of which we have given four figures on Plate VIII. was made by Mr. Cuthbert Clarke, at Belford, in Northumberland; and anſwered exceeding well in meadow-ground; but could not be drawn in a ſtiff clay with the force of eight horſes. Fig. 1. is a perſpective view of the whole inſtrument ſeen on one ſide. Fig. 2. another view ſeen in front. Fig. 3. a third view ſeen at the tail. Fig. 4. a ſection of the plough, to ſhew the diſpoſition of the three coulters.

Note. The ſame letters refer to the ſame parts in all the four figures; ſo that where any of the parts cannot be ſeen in that figure, the letters will not be found.

A, B, C, are the three coulters.

D, E, F, the nuts and ſcrews that faſten the coulters to the beams.

G, H, I, a wheel, or rather roll, which prevents the plough from going any deeper in the earth. This roll is divided into three parts, by circular pieces of iron, which project beyond the roll; and cut the turf into three parts. The coulters follow in the ſame tract, and finiſh that part of the work.

K, K, the centers on which the roll turns.

L, L, the nut and ſcrews which faſten the iron arbour in which the pivots of the rolls turn to the beams. Theſe arbours are kept in their proper places by means of the two iron braces *f*, *f*.

M, a large iron-hook, to which the chain by which the inſtrument is drawn is faſtened.

N, the tow-chain, or that by which the plough is drawn.

O, the head of the plow into which the beams are mortiſed.

P, Q, R, the three beams.

S, a ſhoe of iron, (the whole part from S to A being of that metal) and into which the hoof of the plough is inſerted.

T, a ſhelf on which the mould riſes after it is cut up by the coulter and fore part of the ſhare, till it is thrown out of the trench by the mould-boards.

V, V, the mould-boards, which throw the earth out on each ſide of the trench.

W, W, a band of iron, which faſtens the after-part of the plough to the main or middle beam.

X, the head of a tenon, which faſtens the mould-boards, and hoof of the plough to the main beam.

Z, Z, the two handles, like thoſe of a common plough.

a, *b*, a piece of board tenoned into the handles, in order to keep the handles in their proper poſition.

c, *d*, repreſents the ſurface of the ground when the plough is at work. Therefore all the parts below that dotted line are under the ground when the drain is cutting.

f, *e*, *g*, ſhews the angle which the coulters make with a line drawn parallel to the horizontal plane; and is nearly equal to forty-five degrees.

The figures are drawn on a ſcale of an inch to a foot; but many of the parts, being drawn in perſpective, cannot be meaſured.

We imagine it will be unneceſſary to ſay any thing farther with regard to the manner of working this plough, as the operation is the ſame as that with the common plough. But it may not be amiſs to obſerve, that the angle *f*, *e*, *g*, being greater than that by which the horſes draw upwards, the plough has too great a tendency to get into the earth; the conſequence of which is, that, when the ſoil is very ſtiff, and conſequently requires a very great force to draw the plough, the inſtrument cannot be held properly by the handles, the force of ſix men not being ſufficient to do this, but the plough will turn entirely over. This was ſufficiently apparent to the committee of the Society, at the firſt experiment, when the ploughs were tried in a ſtiff clay; for the tail of this very plough could not be kept down by ſix men at the handles. If therefore the angle *f*, *e*, *g*, were leſſened to about thirty-three degrees, this difficulty would, in a great meaſure, be removed. However, in marſhy, boggy, and moory ſoils, it will anſwer the intention extremely well, and make a clean trench of the dimenſions required by the Society; and therefore cannot fail of being a very valuable acquiſition in the practice of agriculture.

DRAPE, a farrow cow, or one whoſe milk is juſt dried up.

DRENCH, phyfick, &c. given to a brute by means of a horn, cut properly for that purpofe.

DRILL-PLOUGH, an inftrument for fowing corn in drills, or rows, which is an effential part of the new hufbandry.

The two firft inventions for fowing in this manner were Mr. Worlidge's drill-plough, and Don Jofeph de Lucatello's fembrador, both of which may claim the merit of inventions, and therefore muft not be omitted in this work.

" Befides the ufual method of fowing corn, there are, fays Mr. Worlidge, feveral other ways of difperfing it, as by fetting, and hoeing of it in, &c. This art of fetting corn feems to be very ancient, as appears by Virgil, *Unguibus infodiunt et ipfis fruges.* And hath been a long time attempted to be brought into practice again, as appears by Mr.Platt' Adam's Tool revived." Mr. Worlidge then points out the defects in Mr. Platt's inftruments, and proceeds thus :

" But to remedy and remove all manner of errors and inconveniencies that can be found in fetting of corn, I fhall here give you a plain and perfect defcription of an eafy and feafible inftrument that fhall difperfe your corn, grain, pulfe, of what kind foever, at what diftance, and in what proportion you pleafe to defign, and that with very great expedition, and very little extraordinary charge, expence, or hazard.

" Firft, make a frame of timber, of about two or three inches fquare, the breadth of the frame about two feet, the height about eighteen inches, the length about four feet, more or lefs as you pleafe, as at *u u u u*, Fig. 1. Plate IX. Place this frame on two pair of ordinary wheels, like plough-wheels. The axle-tree of the two foremoft wheels is to lock on either fide, as doth the fore axle-tree of a waggon, for reafons hereafter fhewn. The hindermoft axle-tree, being of iron, and fquare in the middle, muft be fixed to the center of the wheels, that the axis and wheels may move together : then, about the middle of the frame, in the bottom, let there be fixed an iron inftrument, or of wood pointed with iron, like unto a coulter, made a little fpreading at the bottom, in the nature of a fhare, made to pafs through two mortifes on the top, for its greater ftrength ; and made alfo to be wedged higher or lower, according as you will have your furrow in depth, as at *o o* ; the ufe whereof is only to make the furrow : fo that you muft make the point thereof of breadth only to move the earth, and caft it, or force it, on either fide, that the corn may fall to the bottom of the furrow. Then, over this fhare, or coulter, a little behind it, may a wooden pipe be made, to come from the top of the frame to the lower end of the fhare, tapering downward, as at *p*, and as near as you can to the fhare : to deliver the corn immediately, as the ground is opened, and before any earth falls in ; that what earth does afterwards fall in, may fall on the corn. This pipe is to proceed out of a large hopper fixed on the top of the frame, that may contain about a bufhel, as at *q* : but fo that the corn may gradually defcend, according to the quantity you intend to beftow on an acre. At the very neck of the hopper, underneath, in the fquare hollow thereof, muft be fitted in the edge of a wheel of wood, about half an inch thick, and proportioned to the cavity of the neck, as behind the letter *r*. The wheel need not be above two or three inches diameter, and fixed on an axis extending from one fide of the frame to the other : on which axis is alfo to be another wheel, with a groove on the circumference thereof, like the wheel of a fpit or jack, as at *r*, which muft anfwer to another wheel of the like nature and form, fixed on the axis of the hindermoft of the wheels, as at *s* : then fit a line (of filk is beft, becaufe it will not be fo apt to fhrink and reach as hemp) about thefe two wheels, that when the inftrument moves on the hindermoft wheels, by the means of the line, the fmall wheel at the neck of the hopper, may alfo move ; which leffer wheel in the neck of the hopper, may have fhort pieces of thick leather fixed in the circumference thereof, like unto the teeth of a jack-wheel, that upon its motion it may deduce the corn out of the hopper, in what proportion you pleafe : for in cafe it comes too faft, then you may by a wedge at the tenon of the piece whereupon the hopper refts, as at *t*, or at the end of the axis of the leffer wheel, force the wheel and hopper together ; as, in cafe it feeds too flow, then may you remove them by the fame wedges to a farther diftance ; alfo in cafe your line be too flack or too hard, you may prevent either extreme by a wedge in the place where the axis of the wheel moves ; or by a third wheel, about the middle of the line, made to move farther or nearer, as you fee caufe.

" Alfo by means of the iron-rod *v v*, fixed to the foremoft axis that is made to lock, may you guide your engine at pleafure ; which rod is made crooked at the end of the hopper, left that fhould injure its motion.

" And at the turning, you may lift up your engine by the handles at *x* : for whilft you lift it up, the corn feeds not until you fet the fame down again.

" One horfe and one man may work with this inftrument, and fow land as faft or fafter than fix horfes can plough ; fo that you may with eafe compute the expence, in cafe your inftrument be fingle : but you may in the fame frame have two fhares at twelve inches diftance, more or lefs, as you will have the rows of corn diftant the one from the other ; and two pipes out of the fame hopper, and two fmall wheels on the fame axis, with other wheels anfwerable, every whit as eafy to be performed as one ; and then you may double your proportion of land in a day.

" This inftrument will always keep the fame proportion you firft fet it to, which you muft thus contrive. Firft, know the length of the furrow you fow : then caft up how many of thefe furrows at fuch diftance your inftrument is made for (whether a foot, more or lefs) will amount to an acre : then conclude how much to fow on an acre ; as fuppofe a bufhel : then divide that bufhel into fo many parts as you have furrows or diftances in that acre : then take one or two of thofe parts, and put into your hopper, and obferve whether it will hold out, or fuperabound at the end of one or two furrows, and accordingly proceed and rectify the feeder : or you may judge by your own reafon, whether it feed too faft or too flow.

" In cafe it feeds too faft, notwithftanding they be clofe placed together, you may make that wheel at the loweft axis, wherein the line moves, to be lefs than the upper ; then will the motion be flower : and thus may you make it move as flow as you will, by augmenting the upper, and diminifhing the lower wheels wherein the line is ; and make it move fafter by the contrary rule.

" In cafe you drive apace, it feeds apace : in cafe you drive but flow, it feeds but flowly : here is no error.

" When you come to any turning at the land's end, by lifting up the hindermoft part of the inftrument, that thofe wheels touch not the ground, the feeding of the corn immediately ceafeth, until you fet it down again.

" Alfo all the corn you fow lies at a certain depth, none too deep, nor any too fhallow.

" You may place a kind of harrow to follow ; but the beft way is to have on each fide of each furrow, a piece of wood, a little broad at the end, fet aflope to force the earth rounding on the corn. This may be well placed and fitted to the bottom of this inftrument, juft behind the fhare and feeding pipe.

" By this method of fowing any fort of grain or pulfe, may be faved the one half, and in fome places more, which by the other way is either buried fo deep under clods, that it cannot come up, or elfe is fo fhallow, that the cold in the winter, or drought in the fummer killeth it, or elfe lies on the furface as a prey to the fowls of the air : much alfo thereof falls in clufters, twenty or thirty grains where one or two might fuffice, which are common inconveniencies, and ufually happening to the vulgar way of fowing corn : the greater half by far is loft, which in all probability may be faved by the ufe of this very inftrument, which will doubly requite the extraordinary charge and trouble thereof : for here is no corn fowed under clods, but in rows, as the earth is ftirred and moved : it is all at one certain depth and at one certain diftance, and equally covered, below the injury of froft, and heat, and rapine of birds. Alfo by this way corn may be fown in the very middle or con-

PLATE IX.

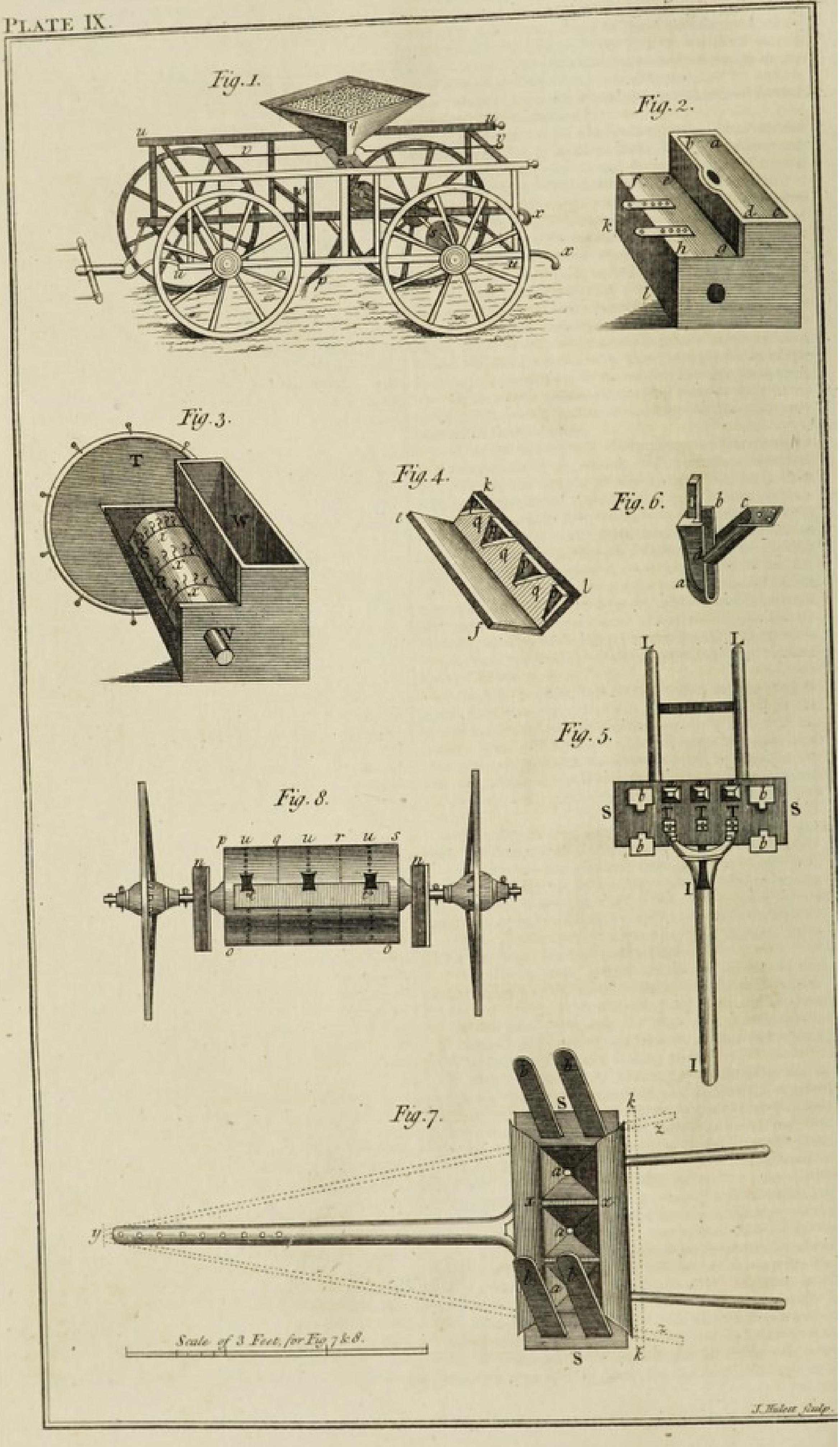


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 6.
Fig. 5.
Fig. 8.
Fig. 7.
Scale of 3 Feet, for Fig. 7 & 8.
J. Hulett sculp.

 D R I

venient depth of the mould, that it may have the ſtrength of the land both below and above the root; whilſt in the other more uſual way, the corn falls to the bottom of the furrow on the gravel, clay, or ſuch like hard ground, where it ſeldom thrives ſo well as what happens to be in the midſt. This way alſo exceeds the way of ſetting corn, where the pins thruſt into the ground harden and faſten the mould, ſo that, unleſs the land be very light, it confines the roots to too narrow a place, which in this way is prevented; as I have obſerved in garden beans, that thoſe hoed in proved better than thoſe ſet with a ſtick.

"By the uſe of this inſtrument alſo may you cover your grain or pulſe with any rich compoſt you ſhall prepare for that purpoſe, either with pigeon-dung dry or granulated, or any other ſaline or lixivial ſubſtance, made diſperſeable, which may drop after the corn, and prove an excellent improvement: for we find experimentally, that pigeon's-dung ſown by the hand on wheat or barley mightily advantageth it in the common way of huſbandry: much more then might we expect this way, where the dung, or ſuch like ſubſtance, is all in the ſame furrow with the corn; whereas in the other vulgar way, a great part thereof comes not near it.

"It may either be done by having another hopper on the ſame frame behind that for the corn, wherein the compoſt may be put, and made to drop ſucceſſively after the corn: or it may be ſown by another inſtrument to follow the former, which is the better way, and may both diſperſe the ſoil, and cover both ſoil and ſeed.

"The corn alſo thus ſown in ranges, you may with much more conveniency go between, and either weed it or hoe it, and earth it up as you think good, and at harveſt it will eaſily repay the charges.

"Alſo the fore-wheels being made to lock to and fro on either ſide, you may have an upright iron-pin fixed to the middle of the axis, extended to the top of the frame: and from thence a ſmall rod of iron to come to your hand, with a crooked neck juſt againſt the neck of the hopper; by means of which iron rod, you may lock or turn the wheels either way, and guide your inſtrument, and rectify it, if it deviate out of its right courſe.

"The hopper muſt be broad and ſhallow, that the ſeed preſs not much harder when it is full, than when it is near empty, leſt it ſow not proportionably.

"Though this inſtrument may at firſt ſeem myſterious and intricate to the ignorant, yet I am confident it will anſwer to every particular of what I have written. Any ingenious wheelwright, joiner, or carpenter, may eaſily make it with very little inſtruction, and any ordinary ploughman may uſe it."

The chief inconvenience in this inſtrument ſeems to be, that the ſeed is liable to be bruiſed as it drops from the hopper, by the wheel in the neck of that hopper.

In the account which is given of the ſembrador, in the Philoſophical Tranſactions, it is juſtly obſerved, that the perfection of agriculture conſiſts in ſetting the plants at proper diſtances, in ground well looſened to a ſufficient depth, that their roots may be able to ſpread, in order to collect the nouriſhment which is neceſſary to produce and ripen their fruit. But this is ſo little obſerved, that almoſt all ſorts of ſeed are commonly ſown by handfuls at random; whence it happens, that corn is ſowed too thick in ſome places, too thin in others, and, frequently, the greater part of it is either not covered at all, or not deep enough; by which means it is not only expoſed to be eaten by birds, but alſo in cold countries to be ſpoiled by froſt, and in hot climates, by the ſun. To remedy theſe inconveniencies, Don Joſeph de Lucatello invented an inſtrument, which, being faſtened to the tail of the plough, drops the ſeed regularly in the furrow, ſaves four parts in five of the quantity which is generally uſed, and becomes the means of procuring a conſiderable increaſe, without employing a perſon purpoſely to ſow.

As a few words will explain the mechaniſm of this inſtrument, which has its merit, though it has not been found to anſwer in common practice, we ſhall venture to give the following ſhort deſcription of it; becauſe ſome of the principles of this may poſſibly ſuggeſt an uſeful hint to an ingenious artiſt.

Fig. 2. Plate IX. is a box of wood: *a*, *b*, *c*, *d*, the cover of that part into which the corn is put, and which is open in Fig. 3. at W: *e*, *f*, *h*, *g*, *k*, *l*, Fig. 2. are the two ſides which cover that part of the box where the cylinder, which is ſtuck round with three rows of little ſpoons to throw out the grains, is turned round. Theſe ſides are taken off in Fig. 3. to ſhew the cylinder R S, and the ſpoons *x*, *x*, *x*. The internal ſhape of theſe ſides is expreſſed in Fig. 4. where may be ſeen the four triangular pieces *p*, *p*, *p*, *p*, and the triangular interſtices *q*, *q*, *q*, which ſerve to convey the corn diſcharged by the ſpoons, to holes which let it out at the bottom of the box. T, is one of the wheels which turn the cylinder; and V the other end of the cylinder, on which the other wheel is to be fixed. The furrow in which the grain has been dropt is to be covered by the next turn of the plough; to which end the mould-board muſt project conſiderably.

In uſing this inſtrument, according to Don Lucatello's method, it muſt be faſtened to the beam of the plough, at ſuch a height that the long projecting nails in the wheels may touch the ground ſufficiently to make them turn round, but not enough for the wheels to reſt upon it, and drag along without turning.

This way of turning the wheels, and conſequently the cylinder, muſt occaſion an unequal diſtribution of the ſeed, wherever the ground is rough and ſtony. For this reaſon, and on account of ſome other inconveniencies attending the uſe of it, the ſembrador is not an inſtrument to be recommended to farmers: but we would here refer to the conſideration of ſuch as are better ſkilled in theſe matters whether an inſtrument leſs liable to this objection, or to the fault which is found in Mr. Worlidge's drill, may not be formed, by placing the ſeed-box of the ſembrador in a frame like that of Mr. Worlidge, with (inſtead of the wheels of the ſembrador, which turn upon the ground) two wheels, grooved like pullies, fixed upon the axis of the cylinder, to be turned with cords, like the ſmall wheel at the neck of Mr. Worlidge's hopper. A ſquare frame, like that, will keep the box more ſteady, and therefore render the diſcharge of the ſeed more regular, than it can be in Don Lucatello's manner.

M. Duhamel obſerves, that the drill-plough invented by M. de Chateauvieux delivers the grain with the greateſt exactneſs, and therefore deſerves much commendation; but that the price of it is too great for moſt farmers. His own, which we ſhall now deſcribe, has, for that reaſon, been the moſt generally uſed.

M. Duhamel's drill is faſtened to the fore-carriage of a common plough. The hind part conſiſts of a plank S S, Fig. 5. Plate IX. at leaſt three inches thick, which is called the table. Underneath this table, and to the bottom part of it, are ſtrongly fixed, as at T, T, T, three ſhares. The beam I, I, is faſtened to the fore-part of the table: and the handles L, L, are let into mortiſes in the back part of the table, in which they are fixed. *a*, *a*, *a*, are three ſloped cavities cut in the table, to receive the ſeed from the cylinder, and convey it through a hole, about an inch in diameter, in the center of each of them, into the hollow *c*, at the back of the ſhare Fig. 6. The form of theſe cavities is more clearly expreſſed by *a*, *a*, *a*, Fig. 7. At *b*, *b*, *b*, *b*, Fig. 5. are fixed four ſtrong ſtandards, to hold the drill-box ſteady.

The ſhares Fig. 6. are made of wood, and terminate at the bottom of their fore-part *a*, in a circular form, covered with iron. In their hind-part *b* is a groove, through which the ſeed drops to the bottom of the furrow. The ſeed is conveyed from the cavities *a*, *a*, *a*, Fig. 7. to this groove *b*, Fig. 6. by means of a thin plate of iron *c*, rounded and fixed to the ſhare, as at *d*. Theſe ſhares are about an inch and a half thick, and their height from *a* to *b* is at leaſt a foot.

As theſe ſhares terminate in a curve at bottom, if they meet with any roots, dung not thoroughly rotted, or any other ſubſtance which they cannot eaſily divide, they force it down to the bottom of the furrow, and by that means are never liable to be choaked: and to prevent this ſtill more effectually, the middle ſhare is placed

ſomewhat

fomewhat more backward than the two others. It is likewife made fhorter, when ufed in land laid out in ridges, in proportion to the greater height of the middle of the ridges. The fhares are generally feven inches afunder.

The four ftandards *b*, *b*, *b*, *b*, Fig. 5 and 7, are placed in fuch a manner, that the blocks *n*, *n*, Fig. 8, in which a groove is cut, anfwer to the middle of this table. On an iron axle-tree which anfwers to the wheels, and which paffes through the centre of the blocks, is fixed the cylinder, or barrel *o*, *o*, which is clofed at its ends, *p*, *s*, and is likewife divided by two partitions *q*, *r*. This barrel is made of thin fplit deal, as are alfo the ends and partitions. *t*, *t*, is a thin board, or plate of tin or thin iron, faftened with hinges, that it may be opened to put the feed into the three partitions *p q*, *q r*, *r s*. In the middle of each of thefe partitions, the barrel is pierced with holes three or four inches afunder, and about a quarter of an inch in diameter. The barrel and the wheels are fo fixed on the iron axle-tree, that they all turn together.

To know whether the holes *u*, *u*, *u*, in the three partitions of the barrel are of a proper fize and number to diftribute the feed in the manner that is defired, let fome, fuppofe half a bufhel, be put into each partition. The blocks *n*, *n*, being placed on each fide, between the two ftandards, whofe inner fides are rounded fo as to fit the groove in the blocks, and the table *S*, *S*, being raifed fo that the wheels do not touch the ground, any one may eafily fee, by giving the wheels a turn or two round with the hand, whether the proper quantity of feed drops behind the fhare; and alter it accordingly.

The barrel being properly fitted, the beam is faftened to the fore-carriage of this drill. As it moves, the barrel turns with the hind wheels, and the feed drops out of the holes *u*, *u*, *u*, Fig. 8. into the cavities *a*, *a*, *a*, Fig. 7, and from thence into the hollow *c*, Fig. 6. in the hind part of the fhare.

When the plowman comes to the end of the field, he lifts up the hind carriage, which is light, and carries it till the horfes are turned for the next furrow.

M. Duhamel does not fix the diameter of the hind wheels, but leaves that to be determined by the length of the fhares. His were fo proportioned, that when the fhares touched the ground, the wheels did not touch it by two inches. He obferves, that this drill anfwered extremely well, where the ground was plowed into an even or level furface: but that the wheels were too fmall when the middle of the ridges was raifed high; becaufe the fhares were then on the higher part of the ridge, while the wheels were in the furrows.

In Fig. 7, are two thin boards *x*, *x*, fomewhat bending, which rife up to about half the height of the barrel. The ufe of thefe is to catch the feeds that may chance to drop from the oblique holes, and guide them into the cavities *a*, *a*, *a*.

It is well known, that when the fore-part of the fhare terminates in a point, it pierces the deeper into the earth, the farther back the beam is placed on the fore-carriage: but as the bottom of thefe fhares is round, they pierce neither more nor lefs when the beam is placed more forward. It is therefore advifeable to place the fore and hind carriage as near as poffible to each other, becaufe the plough then goes eafier, and the draught is lighter to the cattle.

This inftrument is eafily tranfported from place to place by means of two poles *y*, *z*, *z*, Fig. 7. The ends *y* are placed on the fore-carriage, together with the beam, and from thence pafs under the table, fo as to raife the whole from the ground, on which their other ends *z*, *z*, reft. The crofs-bar *k*, *k*, fecures thofe ends, and keeps them at a proper diftance.

M. Duhamel took the firft hint of his feed box from an invention of Mr. Grenville, a gentleman belonging to the king of France's ftables. This was a hollow ball, fixed upon the axle-tree of two wheels, and pierced round the middle with a row of holes, through which the feed dropt as the wheels turned round. Upon a fimilar principle, another gentleman, inftead of fowing under furrow in the common way, contrived a box to turn behind his plough; and that no more than the due quantity of feed fhould be dropped, the lower half of the box moved upon a belt of leather, in the middle of which was fixed a piece of brafs pierced with a hole fuited to the fize of the feed intended to be fown. By this means, the holes in the box could not drop any feed, but when they came oppofite to the hole in the belt. A few grains were indeed fometimes bruifed in their paffage; but, upon the whole, there was a great faving of feed.

According to the above conftruction of M. Duhamel's drill, the fhares muft always pierce to the fame depth, becaufe the whole weight of the hind part of the drill refts continually upon them: confequently, it would be neceffary to have fhares of as many different lengths, as there are depths at which each kind of feed fhould be fown.

We likewife apprehend, that when the fhares have pierced to the depth intended, the weight of the drill may be made to reft on the wheels, by preventing the axle-tree from rifing between the ftandards, beyond fuch a height as fhall exactly regulate the depth to which the fhares are to pierce. This may be effected, by bringing the ftandards *b*, *b*, Fig. 7, nearer to each other; and placing between them, inftead of the blocks *n*, *n*, Fig. 8, two thick pieces of wood, made to flide up and down, with grooves, as in the blocks. Thefe pieces of wood may be fixed between the ftandards, by means of two ftrong iron pins run through the ftandards into them: and to take off the friction of the axle-tree againft thefe pieces of wood, it may be made to turn on two friction wheels, placed in the lower part of them; or rather on four or fix fmall iron rollers turning on their axis in a box inferted in each of thefe pieces, which may be raifed or lowered, by means of a row of holes in the ftandards, through which the iron pins are put, fo as to give the axle-tree room to rife to the height that fhall be thought neceffary to make the fhares pierce to the intended depth, before the weight of the drill fhall reft upon the axle-tree.

That the axle-tree, moving on fuch rollers, will have lefs friction, or require lefs ftrength to make the wheels turn round, even when the weight of the whole inftrument lies upon it, than it has in the blocks, with only the weight of the grain, is evident from the following fact. The gentleman who firft thought of this invention applied it to a roller of four tuns weight, which is now drawn with eafe by two ordinary horfes, even acrofs his plowed grounds.

It appears from this eafy motion of the roller, that there can be no danger of the axle-trees turning, though loaded with the weight of the whole inftrument. Other confiderable advantages will alfo arife from the drill's refting thus upon the wheels; for the labour of the plowman will be greatly leffened, the inftrument will move fteadier and more uniformly, and the draught will be much eafier for the horfes.

Defcription of M. de Chateauvieux's Drill-Plough, *and of its manner of working. Written by himfelf.*

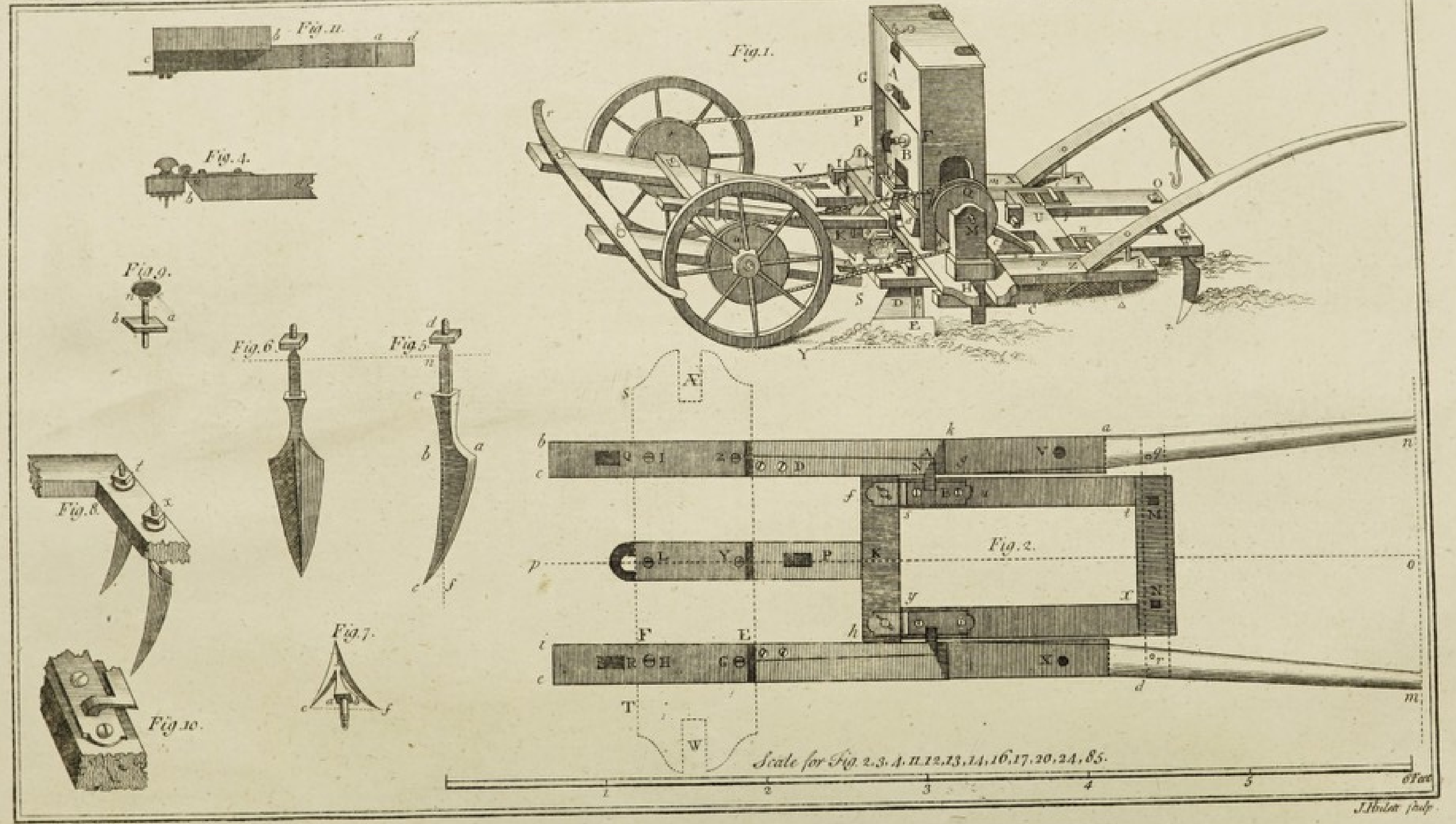
"When I firft fet about conftructing this drill-plough, my defign was to make an inftrument which fhould diftribute the grains of corn one by one, at the diftance of fix inches from each other. I attained this precifion; but foon perceived that it was not the only thing requifite, or even fo neceffary as I had imagined.

"I could, indeed, make my drill diftribute fome grains more than it did in its firft ftate: but I plainly found that the quantity of feed would not yet be fufficient to produce a proper number of plants; efpecially as it muft not be expected that every feed will grow; 1, becaufe, whatever care be taken in chufing the feeds, there will always be among them many which will not fprout at all; 2, becaufe a great number of them will be deftroyed by infects, either before they vegetate, or foon after they fpring up; and 3, becaufe the winter's cold will frequently deftroy feveral of the young plants, and greatly weaken others. Experience taught me, that, to guard againft the effect of thefe cafualties, it was neceffary to fow more feed than I did at firft.

"To this end, and that I might be enabled to increafe the quantity to whatever degree fhould be found moft proper, I enlarged the cavities of my cylinder, fo that I can now fow either more or lefs feed, with equal eafe, by means which fhall be explained in the defcription of this inftrument.

Each

PLATE. X. Facing Drill Plough.



J. Heslet sculp.

" Each of these cavities in the cylinder of my first drill-plough could contain but one grain of corn; but in the present, they are large enough to hold three or four, which, though they touch one another there, are so separated when they fall from thence, and in their passage through the pipes, that they drop at distances from each other in the furrow; for they are not all turned out of the cavities in the cylinder at the same time: besides which, I have observed, that the ground upon which they fall is always more or less uneven, and that this circumstance consequently contributes effectually to separate them.

" I confess that the description which I am going to give is very long, and that this, together with the sight of so many figures as are here represented, may, at first, make people think that my drill is a very complicated machine, and that this complication must render it very defective: but I beg of them not to give way to this prejudice, and to suspend their judgment, till they have studied the instrument thoroughly; after which, I hope they will be sensible that all its mechanism is employed only to procure the movement of the axis, and the play of the valves. I even flatter myself that it will be deemed a simple instrument, by those who rightly consider how few of its parts are moved; a circumstance which prevents its being put out of order in working. The great quantities of land which were sowed in the autumn, with perfect success, ought to remove the diffidence of those who may still incline to doubt whether this drill will always and regularly perform equally well.

" It will perhaps be objected, that the expence of making this drill-plough is too great, and that numbers of farmers, who have not much land, may not be able conveniently to purchase it.

" It is very true that if this instrument could be constructed for a small price, the benefits resulting from it would be the more extensive: but it must also be allowed that this objection does not hold good with respect to all farmers, or to gentlemen who keep ground in their own hands. These will soon be repaid the expence of such a drill, by the saving of seed: and as to the poorer sort, who have, for example, but ten or twelve acres of arable land, the expence will be but trifling, if four or five neighbours, in that case, join to purchase such a drill, which will be more than sufficient to sow all their ground. Or, each parish may come to an agreement, that he who can afford to buy such a drill, may let it out for so much an acre: a method which would be advantageous to all; but particularly to those who, by using it, would sow their land with very little charge.

" But I think, and hope, that when the great advantage of using this instrument is known, no husbandman will be without it merely because of the price; as this consideration can never out-weigh the benefits which will accrue from it in all respects, by lessening the expence of every article in the operation of sowing, and by the farther emoluments which will be reaped at harvest.

" I therefore, in constructing this instrument, paid less regard to the price which it might cost, than to the means of rendering it very solid, by a firm assemblage of all its parts; which was essential, in order to prevent the frequent accidents it would otherwise have been exposed to, in the hands of ignorant peasants, who have no idea of handling things gently, and are still less capable of repairing any mischief done to a very nice machine.

At the same time that I studied strength and solidity in the construction of this instrument, it was not less necessary to take particular care that it should execute well and regularly the purposes for which it is intended, both with respect to the manner of its distributing each grain, and to the movement of the axis, which is always in motion from the moment that the horse stirs, so that the seed runs incessantly.

In describing this instrument, I have first given a general idea of its make and manner of working, that the reader may be thereby enabled the more easily to understand the subsequent minute description of all its parts, with their relation to, and connection with, each other. The method of using it will then follow.

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General idea of M. de Chateauvieux's DRILL-PLOUGH, *Plate* X.

A (Fig. 1,) is a wooden-box, or hopper, whose bottom is at the height of the line F G. This hopper has four feet, two of which are seen at *k* and *l*. These four feet, which may be called tenons, are fitted into four mortises in the table H L. The bottom F G of this hopper rests immediately upon the seed-box B, which is made of thin plates of brass, and is placed between the bottom of that upper box or hopper, its two sides which have the four feet, and the table H L. B is the front of this seed-box. The corn drops through a hole in the middle of the bottom of the hopper A, into the seed-box B. This seed-box B contains a brass cylinder, which traverses it, and is pierced by and fixed to an iron axis M P, at the two ends of which are firmly fastened two pullies Q and P. The two pivots of the axis are supported by two standards, one of which is seen at M H, and a part of the foot of the other at L. These two standards are fixed to the two ends of the table by two keys, like those of a turner's lathe.

The table upon which all these pieces rest, is itself, at its two ends, supported by, and fastened to the two beams T V, R S. These two beams are fixed in parallel lines, by a traverse X Z. In the middle, U, of this traverse, is pinned the end of another piece of wood, which passes from thence under the table, in a parallel direction with the two beams, and upon which also this table is fastened by two screws.

This instrument has three exactly similar shares, D, K, *e*. Two of these shares, K and D, are fastened to the two beams, at I and *p*; by a tenon and a peg, and the third is fastened in the same manner, towards U, to the piece which runs parallel to the beams. Each of these shares is covered at the bottom with a plate of iron, N, E, C; and the point of one of them, supposed to be in the earth, is seen at Y.

The harrow is composed of three pieces of wood *q* O, O W, W *n*, jointed together by mortises and tenons at O and W, and of two similar iron teeth W *z*, O R. These two teeth are fastened to the harrows by the screws W and O, and the harrow is fastened to the traverse X Z by two hinges near *q* and *n*. Upon the two beams are fastened by two screws, at *m* and *c*, two square springs *m i q* and *c Z n*, of which the two ends *q*, and *n*, press upon the harrow, to make its two teeth enter into the earth.

The fore-carriage is composed of two similar and parallel pieces V *r*, S *s*, upon which is fastened the spring-tree bar *r s*, and the axle-tree *u t* of the two wheels. The drill (of which the manner of working will be explained hereafter) rests upon this fore-carriage, whenever there is occasion for its so doing, by means of a wooden bar *d x*, one of the ends of which, towards *a*, passes through two belts which are fastened to the table, and of which only one is seen here. The other end *x* of this bar, rests upon the middle of the axle-tree of the fore-carriage, between two pins driven into the upper part of that axletree. The fore-carriage is likewise fastened to the drill by hooks and rings, as at *v* and S.

At *t* and *u* are two pullies, which are fastened to the spokes of the wheels by three or four screws. The pullies Q and *u* are encircled by a thong of leather, of the same breadth as the grooves of the pullies, and of which the two ends are buckled together, like a garter. The two other pullies P and *t* are encircled in the same manner by another similar thong.

Manner in which the DRILL *works, Plate* X.

The seed being put into the hopper A (Fig. 1.) the whole machine being drawn by the horse harnessed to the spring-tree bar *r*, *s*, and guided by the seedsman, who holds the two handles; then the three shares D, K, *e* C, open each of them a furrow, and at the same time the pullies *u*, *t*, by their turning, turn, by means of the thongs, the two other pullies Q, P, and consequently likewise the cylinder, which is in the box B, and which, in turning, distributes the seeds equally into three pipes which come out at the bottom of the seed-box. This distribution of the seed is performed by a

X x mechanism

mechanism which cannot be represented here, but will be particularly explained hereafter. The ends of these pipes are seen here at *a* and *b*. These pipes *a* and *b* drop the seeds into two other pipes *d* and *f*. The pipe *a* transmits its contents into the pipe *d*, which terminates behind the share D, at *h*, where it deposits the seeds in the furrow made by this share. In the same manner, the end of the pipe *b* of the box conveys the seed which passes through it into the pipe *f*, which terminates at *g*, behind the share K. And likewise in the same manner, the third pipe of the box, which cannot be seen in this figure, empties its contents into a third pipe, of which part is seen here at *v*, *y*, and which terminates behind the third share *e*, C. The two teeth of the harrow, passing afterward each of them between two of these furrows, cover the seeds which have dropped into the three furrows.

According as screw B, in the fore-part of the box is turned more or less from the right to the left, or from the left to the right, a greater or less quantity of seed drops into each furrow, by a means which will be explained hereafter. But so long as this screw remains in the same situation, the quantity of the seed that is dropped will be constantly the same.

To render the description of this first figure the more distinct and intelligible, some things are passed over here, which will be spoken of hereafter, and among others two traverses which fasten together the two pieces V *r*, S *s*, of the fore-carriage. Also the box B is here made larger than it should be according to the description which will be given of it, in order that the pipes *a* and *b*, *d* and *f* might appear the more distinctly. For the same reason also the out-lets of the pipes *a* and *b* are not here represented as let into the mouths *d* and *f* of the two other pipes, as they should be in fact.

In the following descriptions, that part of a piece which immediately faces the horse, is always called the fore-part of the piece, excepting only the piece named the bin, and its valves, in speaking of which the contrary rule is observed. But, every where, the right or the left side of a piece, is to be understood as of the same side of the horse.

When a machine is to be made from drawings, those drawings, especially when small, cannot, by their scale, point out precisely the exact dimensions of every nice, and oftentimes very important, piece, so as to enable a workman to construct it perfectly. To remedy this defect, all the measures of every piece, and their connection with each other, are here particularly specified in the written description, which is to be looked upon as a surer guide than the measures resulting from the engraved figures: and to render this still more certain, the weight of the nicest pieces is also given.

Description of the two Beams which support the Table and the Hopper, Plate X.

The two beams T V, R S, (Fig. 1,) are represented as if seen from above at *a*, *b*, *d*, *e*, (Fig. 2.) They are exactly similar. Each of them is three feet five inches and a half long, two inches and five-sixths wide (for example from *b* to *c*), and one inch five-sixths thick. All their sides are at right angles to each other.

These two beams are joined by a traverse *f h* (Fig. 2.) and X Z (Fig. 1.) This traverse is two inches and five-sixths wide, measuring it horizontally, one inch and three-twelfths thick, and one foot and a half long, exclusive of two tenons, one at each end, by which it is mortised into the two beams, which are parallel to each other. The upper surface of these beams, and that of their traverse, are exactly even. The distance from *c* to *f* (Fig. 2, Plate X.) is one foot eleven inches and a quarter; and the same from *i* to *h*.

Underneath each beam, and at the distance of five inches from the extremity *a* (Fig. 3.) an iron-pin, seven-twelfths, or two-thirds of an inch in diameter, projects to the length of four inches and one-third. One of these pins is seen at Δ (Fig. 1.) Its other end is driven fast into the middle of the breadth of the under surface of the beam, from which it projects perpendicularly. These two pins are to enter into two holes in the axle-tree of the hind-carriage, which will be spoken of hereafter.

Of the two Handles, Plate X.

Two handles, *k n*, *l m* (Fig. 2.) are fastened to the two beams, each of them by a tenon *d*, (Fig. 3. Plate XI.) five-sixths of an inch thick, which passes through the beam, and is secured underneath it by a wooden pin or peg *d*, about half an inch in diameter. Each handle is likewise supported upon the beam by a wooden prop *p l*, which is seen at R and T (Fig. 1.) Each of these props is three quarters of an inch in diameter, and is driven very tightly into the handle and the beam, at *p* and *l* (Fig. 3, Plate XI.) so as to pass quite through them. The upper end *c* of those props is seen at V and X, in Fig. 2. From the extremity *k* of the handle (Fig. 2, and 3.) to the extremity *a* of the beam, is one foot, and one-third of an inch, and the distance is the same from *d* to *l*, in Fig. 2. The breadth and thickness of the lower end of the handles at *g k* (Fig. 2, Plate X. and 3, Plate XI.) is nearly the same as the breadth of the beams, upon which they rest: but they lessen by degrees from *k* to *n*, and are rounded off, in such manner that the diameter of their upper end *n* is but one inch and a third.

With respect to their position, they form, with the beams, an angle of 40 degrees, as at *c k a* (Fig. 3, Plate XI.) The handle is nearly strait from *k*, to about a third part of its length, and from thence it bends more and more downward, to its end *n*, which is perpendicularly two feet higher than the upper surface *k m* of the beam. This height is expressed by the pricked line *n m*. The space between the handles likewise increases with their length, so that, at their smallest ends, the distance from the outside *m* of the one, to the outside *n* of the other (Fig. 2, Plate X.) is one foot eight inches and a half, and each of them is equally distant from the middle line *o p*.

These two handles are fastened to each other by a traverse *q r*, which is represented in Fig. 1, but is expressed here only by two pricked lines, in order to shew a piece which is under it, and which will soon be spoken of. This traverse is one inch and five-sixths broad, and two-thirds of an inch thick. Its ends, being tenons, are let into mortises in the beams, and fastened there by wooden-pins, at *q* and *r*. One of these ends appears at *q* (Fig. 3, Plate XI.) From the middle of the length of this traverse hangs an iron-hook, as in Fig. 1, Plate X. This hook is about a quarter of an inch thick, and five inches and a half long, from its extremity *e* (Fig. 3, Plate XI.) to its other end, which is fastened to the traverse. The lower end of this hook is put through a small ring fastened to the harrow between the screws of the two teeth, and serves to hold up the harrow when the drill is placed upon its hind-carriage, in order to be removed, as will be said hereafter. The traverse is fixed in the handles at the distance of thirteen inches from their extremity *k* (Fig. 2, Plate X. and 3, Plate XI.) The two handles, which the seedsman holds in his hands by their ends *m n*, serve to direct the drill.

Of the Harrow, Plate X.

The harrow is composed of three pieces of wood *s t*, *y x*, *t x*, (Fig. 2.) and of two teeth fastened to this last. These three pieces are represented at *q* O, O W, and W *n*, and the two teeth at W *z* and O R, in Fig. 1. The two pieces *s t*, *y x*, (Fig. 2.) are each of them fastened to the traverse *s y*, by an iron-hinge, in such manner that the upper surface of the ends *s* and *y* of these two pieces is exactly level with the upper surface of the traverse *s y*. Their two other ends, *t* and *x*, are terminated by a tenon which is pinned into the ends of the traverse *t x*. The upper surface of these three pieces *s t*, *y x*, *t x*, is perfectly even.

The two pieces *s t*, *y x*, are each of them one foot eight inches long, from the end *s*, to the traverse at *t*. They are two inches and one-third broad, measuring over their upper surface, and one inch and two-thirds thick. The fore-end of these pieces towards the hinge makes an angle of about sixty-five degrees, with the upper surface, as is represented in the profile (Fig. 4.) where

where the lines *d a*, *a b*, exprefs this angle. This flope is made, in order that the harrow may the more eafily prefs upon the ground, by moving on its hinges; and for the fame reafon all friction between the fides of the harrow and thofe of the beams is avoided, by leaving an interval of about one-fixth, or one quarter of an inch between them. The lines, or edges *t s*, *x y*, (Fig. 2.) are parallel, and the diftance between them is one foot and five-fixths of an inch. The traverfe *t x* is two inches and nineteen twenty-fourths wide, and one inch and two-thirds thick.

In the middle of the breadth of the upper furface of this traverfe, and cut perpendicularly to that furface, are two fquare holes, M and N, diftant from each other feven inches and a half, from the centre of one to the centre of the other, and both equally diftant from the middle line *o p*.

Of the Teeth of the Harrow, Plate X.

In thefe two holes M N in the travefe of the harrow are faftened, as will foon be feen, two iron-teeth, perfectly alike, fo that it will be fufficient to defcribe one of them. This tooth is fhaped almoft like the head of a lance, if we fuppofe its two fides to be bent towards each other, fo as to form a kind of groove or channel. Thefe two fides, or fins, are feen in perfpective, fideways in Fig. 5, behind in Fig. 6, from above, and from before, in Fig. 7.

The fhank *b d* (Fig. 5.) is five inches and an half long, from its rife at *a b*, to its end *d*; and three quarters of an inch thick at *a b*, where it is made fquare. This thicknefs is increafed a little at *c*, in order to form the fhoulder reprefented at *a b* (Fig, 7.) The diftance from *a b* (Fig. 5.) to this fhoulder *c*, is three inches. The fquare thicknefs of the fhank, from *c* to *n*, is half an inch; which is likewife the fize of the holes M N (Fig. 2.) The reft of the fhank is round, and half an inch in diameter. Its upper end is a fcrew, fitted to receive a nut about half an inch thick, and a little more than an inch fquare. The point *e* does not vary from the direction of the fhank, either to the right or the left, as appears by Fig. 6: but the fide *b e* (Fig. 5.) bends a little forward, fo that the point *e* advances one inch and a quarter beyond the pricked perpendicular *n b f*. The upper and outer extremities *c* and *f* of the fins (Fig. 7.) are two inches and one-twelfth diftant from each other, and equally diftant from the middle of the fhank. The width of each fin, in this part, from *s* to *f*, or from *s* to *c*, is one inch and a half. From thence they leffen by degrees down to their point. The edges of thefe fides, or fins, are almoft fharp, but their thicknefs and ftrength increafe towards their back.

The two teeth of the harrow are placed exactly in the middle of two parallel lines fuppofed to be drawn from the point of the fhares; by which means thefe teeth will enter into the ground at equal diftances from the fmall furrows made by the fhares, into which they will throw back the quantity of earth neceffary to cover the feeds perfectly.

As to the pofition of thefe two teeth, they are faftened in the two holes M and N of the traverfe *t x* (Fig. 2.) as is reprefented by the perfpective view of them in Fig. 8. The fhank of each tooth is run through the holes in the traverfe *x t*; its fhoulder is thruft up clofe to the under furface of this traverfe; and a nut, under which is placed a very thin plate of iron, fixes at the top. The back and point of thefe two pieces fhould face exactly the fore-part of the drill.

Hinges of the Harrow, Plate X.

To return to the hinges *s* and *y* (Fig. 2.) which are exactly alike, and which are feen at *q* and *n* in Fig. 1. Their breadth is one inch and two-thirds, during their whole length, from *v* to *f* (Fig. 2.) The joint *s*, of this hinge, is half an inch in diameter. The claw, from the joint *s* to *f*, is two inches and a quarter long, and is faftened to the traverfe *f b* by a thumb-fcrew reprefented in perfpective in Fig. 9, and which fcrews into a nut *a b*, which is faftened to the bottom of the traverfe, by two nails. This fcrew (Fig. 9.) is one-third of an inch in diameter. It is fcrewed down, by means of a correfponding fcrew in the nut under the traverfe, till its fhoulder *c n*, which is two-thirds of an inch in diameter, preffes upon the claw of the hinge: for which fee alfo Fig. 4. The length of the other claw of the hinge *s v* (Fig. 2.) from the joint *s* to its end *v*, is four inches and a half. The thicknefs of each claw towards the joint, is a quarter of an inch, and from thence that thicknefs leffens by degrees to the end *v*. The claw *s v* is faftened to the piece *s t* by two flat-headed fcrews.

Spring of the Harrow, Plate X.

Upon this claw, and between thefe two fcrews, preffes the end B of a fpring A *z* (Fig. 2.) which forms an angle at A, and is faftened to the beam *a b*, between D and *z*, by two flat-headed fcrews, of which the laft D is two inches and an half diftant from the end *z* of the fpring. Thefe two fprings are feen at *m i e* Z *n* in Fig. 1. The length of this fpring from *z* to A (Fig. 2.) is thirteen inches and a half, and from the angle A to B two inches and a quarter. Its breadth at *z* is one inch and a half; at N it is one inch and one-twelfth; and at B it is thirteen twenty-fourths of an inch. Its thicknefs at *z* is five twenty-fourths of an inch, and from thence that thicknefs diminifhes to A, where it is but one-fixth of an inch. The part A B increafes in thicknefs from A to B, where it has a head, which alone preffes upon the claw of the hinge between the two flat-headed fcrews. This part of the fpring, with its head, is reprefented plainly, in perfpective, in Fig. 10. When this fpring is in its ftate of reft, the whole of its under furface from N to *z* (Fig. 2.) lies exactly flat upon the upper furface of the beam. The end *z* of this fpring is fifteen inches from the end *b* of the beam *a b*. Thefe fprings fhould be made of good well-hammered ftuff, prepared like that which is ufed for the fprings of coaches; by which means they will have a body, and not be fubject to break or bend. If they appear to be too weak, they may be placed a little farther from the joint of the hinge, in which cafe they will the better prefs the teeth of the harrow down into the ground.

Connection of the Beams, with the Table and the Shares, Plate X.

The thicknefs of a quarter of an inch is taken off from the upper furface of each of the two beams, from *z* (Fig. 2.) immediately adjoining to the end of the fpring, to Q, in the one; and from E to F in the other; being, in length, eight inches and two-thirds. In thefe lowered fpaces is placed the table, which will foon be fpoken of, and of which the extent is here indicated by pricked lines. This table is feen at H and L, in Fig. 1. It is faftened to the beams, by four ftrong flat-headed fcrews, at *z*, I, G, and H (Fig. 2.) and is feen in profile in Fig. 3, Plate II. at *i* and *r*. This table refts likewife upon a piece K L (Fig. 2.) of which the end K, being a tenon, is pinned into the middle of the length of the traverfe *f h*; as is alfo feen at U (Fig. 1.) This piece K L (Fig. 2.) is two inches and five-fixths broad, meafuring it horizontally, and one inch and five-fixths thick. Its length is fuch, that its end L reaches, at moft, no farther than the edge Q F of the table. At the end of this piece appears a ring, which is faftened under it, and of which the defcription and ufe will be feen hereafter. The upper furface of this piece K L, from K to Y, is level with the upper furface of the two beams, and the traverfe *f h*: but from Y to its end, a quarter of an inch is taken off from its thicknefs, in the fame manner as from the oppofite parts of the two beams, to fit it for the reception of the under furface of the table. A fide view of this is given in Fig. 11. where *a b* is the profile of this furface, which, from *a* to *b*, is level with the furface *d a* of the traverfe, and from *b*, to its end *c*, is a quarter of an inch lower, that the table may reft upon it.

In the middle of the breadth of the upper furface of this piece K L (Fig. 2.) and perpendicular to that furface, surface, a mortise P is cut quite through it, to receive the tenon which is seen at U, Fig. 1. This mortise is throughout two inches long, and one inch wide. Its end P (Fig. 2.) is three inches and eleven twelfths distant from the traverse *f h*. The two beams are pierced in the same manner by two similar mortises Q and R, of which the ends Q and R are one inch and eleven twelfths distant from the side S T of the table. The tenons which pass through these two mortises are seen at I and *p* in Fig. 1. These three mortises are to receive the tenons of three exactly similar shares, of which the following is the description. These three shares are seen at D, K, and *e* in Fig. 1.

Of the Shares, Plate XI.

The shares are cut out of a plank, and Fig. 12 represents one of their two surfaces. The lines which limit this surface are perpendicular to each other, excepting *i d*; the line *d c* is six inches long; *c f*, nine inches; *f g*, two inches and a quarter; *g l*, five inches and a half; *l m*, two inches; and *h i*, half an inch. This plank is every where an inch thick, except at the edge *e d*, where it forms an acute angle, as at *b*, Fig. 13. which represents the bottom of the plank *c d* (Fig. 12.) The part *g l*, in which is the hole *k*, is the tenon which enters into the mortises P, Q, R, (Fig. 2.) before described. Fig. 14. represents the top of this plank, and of its tenon.

Fig. 15, is a perspective view of an iron share which is fixed under the plank, as in Fig. 17. Its point (Fig. 15.) extends from *e b* to *f*. Its sole, which extends from *c b* to *a c*, and the ears *a b*, *c d*, are all of one piece. Fig. 16 represents a geometrical plan of this share, in which *d f*, and *g h*, are the places from whence the two ears arise.

The length of the point from *e b* to *f* (Fig. 15.) and from *a b* to *c* (Fig. 16.) is four inches. Its height towards *b*, or towards *e* (Fig. 15.) is about one inch and a quarter, and from thence it lessens gradually to *f*, which is the point. Its breadth *a b* (Fig. 16.) is the same as the thickness *c o* (Fig. 13.) of the plank of the share, and it lessens gradually from thence to its point *c* (Fig. 16.) A notch is made in the upper part of this point, between *e* and *b* (Fig. 15.) or between *a* and *b* (Fig. 16.) to receive the lower end of the angular side, *o b c* (Fig. 13.) of the plank.

The sole *e a* (Fig. 15.) or *a d* (Fig 16.) is of the same length and breadth as the bottom *c m*, or *o n* (Fig. 13.) of the plank which it covers. It is about, but not more than two thirds of an inch thick towards *e b* (Fig. 15.) and half an inch thick at its end *a c*.

Towards this end are the two thin iron ears, which lie close to the two sides of the plank, to which they are fastened by a single nail, which passes through the plank, as at *h*, Fig. 17.

This share is also fastened to the bottom of the plank by a flat-headed iron pin, *g h*, Fig. 15. which goes through the share at *n*, and enters into the middle of the thickness of the plank. The head *b* of this pin is flat, and lies even with the bottom of the sole, in the manner indicated by the pricked lines at *a*, Fig. 17. Towards the flat end *c* of this pin is a hole, through which, and through the plank, a smaller pin or nail is driven, as is denoted by the pricked circle in the same figure.

The point of the share, and the bottom of the sole, which rubs upon the ground, should be of steel. The different thicknesses given to the sole, shew that its point inclines a little downward, by which means it enters into the earth very easily.

Fig. 18. represents a perspective view of a thin plate of iron, which is to cover the plank of the share, as in Fig. 20. to preserve it from the friction of the ground, which would otherwise soon wear it out. The thickness of this plate, which should be equal every where, is at most one twelfth of an inch. It is bent at *a b*, Fig. 18. in such manner, that this bending fits close to the sharpened edge *c d*, Fig. 20. of the plank; the angle *b*, Fig. 18. being fitted to the notch *c* (Fig. 20.) in the iron part of the share, and the lower edges *b c*, *a d*, of this plate (Fig. 18.) joining on both sides to the upper edges of the sole of the share, as in Fig. 20. The breadth of this plate from *a* to *b* (Fig. 20.) is about four inches, and each half of its length, from *c* to *a*, or from *d* to *b*, is about seven inches and a half. Fig. 19 is the plan, or bottom, of this plate.

As this plate covers the ears of the share, and at the same time its own angle *c* (Fig. 20) is covered by the point of the share, these two pieces must be put on together. This plate is nailed to the two opposite sides of the plank.

The two ends of this plate extend beyond the hindmost part of the plank of the share, in the proportion of *b b*, Fig. 20: and in this space, between these two ends, is the opening of the pipe through which the seed drops into the furrow, as was said before.

The tenon *l g* (Fig. 12) of the share now described, (and there are three such) enters into one of the three mortises, P, Q, R (Fig. 2) through the bottom of which it is passed, and is fixed above by a wedge driven into the hole *k* (Fig. 12). These shares are situated in such manner, that their point faces directly the fore-part of the drill. One of them is represented as fixed towards the end *b* of one of the beams, in Fig. 3, which exhibits the profile of that beam.

Of the Piece which is placed under the Middle of the Table, and which bears the Middle Share, Plate XI.

The piece K L (Fig. 2, Plate X.) which as been already spoken of, is represented with its bottom upward, and in perspective, at *a b*, Fig. 21. Plate XI. with the share A, and its tenon B, and with the table, which are also inverted in the same manner. Fig. 22. is a geometrical representation of the under side of the same piece, and of part of the table, excepting the share, which is omitted here, and of which only the bottom of the mortise is seen at B.

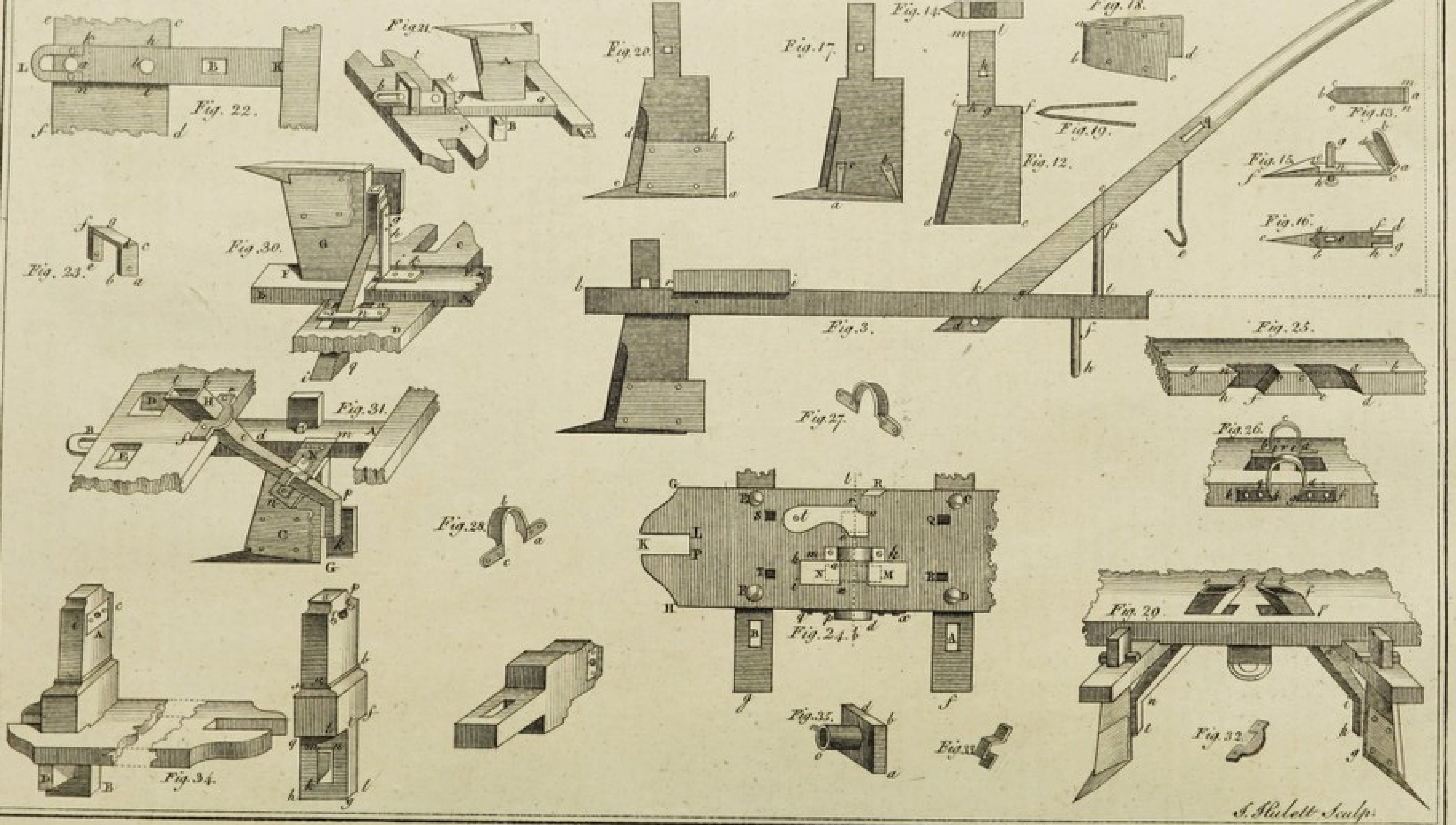
To the end L of this piece (Fig. 22.) is fastened the reign, or bridle before mentioned. This bridle is shaped nearly like a horse shoe; the breadth of each of its branches is three fourths or five sixths of an inch; its total breadth is the same as that of the piece to which it is fastened; its total length is three inches and a half, and its thickness every where is about one sixth of an inch. The whole thickness of the two branches of this bridle is let into the piece of wood to which it is fastened; so that it forms an even surface. This bridle is fastened to the piece by two flat headed screws, which lie even with the branches of the bridle, through and into which they are screwed. It is placed in such manner, that the outside of its circular part L, is one inch and a quarter distant from the edge *e f* the table. It is used only when the drill is put upon its hind-carriage.

a and *b* are the heads of two large flat-headed screws, which pass through the piece K L, and fix it to the table. From the centre of the head *b*, to the edge *c d* of the table, is one inch and two thirds. From the centre of the head *a*, to the edge *e*, *f* of the table, is one inch and one third. These two screws are placed in the middle of the branch of this piece K L. Their diameter is five twelfths of an inch, and that of their head is an inch and a twelfth. These heads are flat, and screw in a level with the wood.

Of the two Bridles which receive the End of the Bar which supports the Drill upon its Hind-carriage, Plate XI.

Underneath this piece K L, are likewise fastened two bridles very like each other. They are represented in perspective by the single figure 23; but both of them may be seen in their proper places, at *g h* and *e f*, Fig. 21. Their place in Fig. 22 is marked only by pricked lines, in order to let the pieces under them be seen. These two bridles are made of a flat piece of iron, one inch and a sixth wide from *a* to *b*, or from *c* to *d* (Fig. 23.) and a very little more than one sixth of an inch thick. They are bent square at *c d* and *f g*, and are pierced with two holes, *h* and *e*, one fourth of an inch in diameter, of which the centers are three fourths of an inch from the ends of the iron. Thus far these two bridles are like each other. What they differ in, is as follows. That which is placed at *g h* (Fig. 21.) is three inches and one sixth high, from its bottom *a*, to the upper surface of its

top



J. Hulett Sculp.

top *c*, or from *e* to *f*, Fig. 23; and this height in the belt which is placed at *e f* (Fig. 21.) is three inches and five twelfths: That which is placed at *g h*, is two inches and five sixths long, from its outside at *c d*, to its outside at *g f* (Fig. 23.) and this part of the bridle placed at *e f*, is three inches and one third.

Both these bridles placed at *g h* and *e f* (Fig. 21.) go over the piece of wood *a b*, to which their ends are fastened by flat-headed screws, which pass through the holes *b* and *e* (Fig. 23.) beforementioned. These ends rest immediately upon the table. As the distance between the ends of the bridle *e f* is exactly equal to the breadth of the piece to which they are fastened, they are applied to the two lateral surfaces of that piece, without being let into it: but as the bridle *g h* is not quite so long, the ends of this are let into those surfaces, as is seen in Fig. 21. and in the pricked plan of these two bridles, *h i*, *k n*, Fig. 22. The end of these bridles stand perpendicular to the table. The bridle *g h*, Fig. 21. is one inch and fifteen twenty-fourths from the edge *t s* of the table; and the bridle *e f* is five inches and eleven twelfths distant from the same edge *t s*.

The use of these two bridles is to receive the end of the bar hereafter described, which serves to support the drill upon its fore-carriage, when the hind-carriage is joined to it: and to prevent this end of the bar from slipping out of these bridles, a moveable iron pin is put through it. This pin is suspended by a piece of pack-thread. It passes through the bridle L (Fig. 2. Plate X. and 22. Plate XI.) and *b* (Fig. 21.) before described.

Of the upper Surface of the Table, Plate XI.

Fig. 24. represents a geometrical plan of the upper surface of the table, one end of which is omitted, as superfluous in this figure, because both its ends are alike. The pricked line *l b* is traced here only to mark the middle of the table, and determine some measures. The fore-ends of the beams appear here at *f* and *g*, with their mortises A and B, into which their shares are fastened. C, D, E, F, are the four large flat-headed screws which fasten the table to the beams. The diameter of these screws towards their head is five twelfths of an inch, that of their head is one inch and a twelfth, and their length is three inches and seven twelfths. They enter into the middle of the breadth of the beams, and the centers of the holes in the tables through which they pass, are eleven twelfths of an inch distant from the nearest edges of the table. The whole breadth of the table, at C D, or E F, is eight inches and two thirds. The two corners G and H are thirteen inches distant from the middle line *l b*, and the end K is one foot three inches and three fourths distant from the same line *l b*. The thickness of this table is every where one inch and two thirds.

At each end of the table is a notch K L P, of which the inner surfaces are perpendicular to each other. These notches are at H and L in Fig. 1. Plate X. Each of them is three inches and three quarters long, from K to L, Fig. 24. and one inch seven twelfths wide from L to P. They are situated in the middle of the breadth of the table. Their use is to receive the lower end of two standards hereafter described (Fig. 34.) of which one is seen at M H, Fig. 1. and the base of the other towards L.

This table has two holes, M and N (Fig. 24.) of which the upper openings are exactly equal, and alike situated, each of them forms a right-angled parallelogram *a b i n*. The side *b i* is parallel to the edge D F of the table, from which it is one inch and a half distant, and its length is three inches and a quarter.

The upper edge of the end *a n* is eleven twelfths of an inch distant from the middle line *l b*, and its length is one inch and eleven twelfths. The inner and parallel sides *a b*, *n i*, of these holes are perpendicular to the upper surface of the table; but their ends *a n*, *b i*, are sloped, in such manner, that each of them forms an angle of fifty or fifty-five degrees towards the line *l b*. This is expressed in the profile of these two holes (Fig. 25.) by the angles *b a d*, *b c e*, and *g o f*, *g n h*, each of which has that measure.

Q, R, S, T, are four mortises, of equal size and depth, cut perpendicularly to the upper surface of the table. Each of them is nineteen twenty-fourths of an inch long, in the same direction as the length of the table, two thirds of an inch wide, and about one inch deep. They are intended to receive the four feet of the hopper, which will be described hereafter. Two of these feet are seen in their mortises at *k* and *l*, Fig. 1. Plate X The centre of each of these mortises is six inches and five twelfths distant from the line *l b* (Fig. 24.) and an inch and three quarters from the edges C E, D F, of the table.

Of the Bridles which receive the End of the Bar which supports the Drill upon its Fore-carriage, Plate XI.

From *k* to F, Fig. 24. is a bridle which is seen in front in Fig. 26. It is made of iron, one inch, or one inch and a twelfth broad, and one sixth of an inch thick. It is bent in a semi-circle at *a c b*, and lies flat upon the table at its end *a* and *b*, which are fastened to it by two flat-headed screws *a* and *b*, Fig. 26. and *k m*, Fig. 24. This bridle is perpendicular to the upper surface of the table. The highest part of the upper side of its arch *c*, Fig. 26. is two inches above the table; and its width, from outside to outside, from *e* to *i*, is two inches and a half. The length of each strait part, or claw, which is fastened to the table, is one inch and a quarter. The centres of the screws *k* and *m* (Fig. 24.) are each one inch and three quarters from the middle line *l b*, and four inches from the edge D F of the table.

d r q (Fig. 26.) is the upright of another bridle, of which the top, or upper surface, is seen at *x d p q*, Fig. 24. the front and side in the perspective figure 27, and the back and sides in the perspective figure 28. The hinder surface of the two claws, represented at *a* and *c* (Fig. 28.) is screwed on to the fore-surface of the table, as at *f g* and *h k*, Fig. 26. by two flat-headed screws, each of which is one inch and seven twelfths long, and near a quarter of an inch in diameter towards its head, which is half an inch in diameter. The middle of this bridle answers to the middle of the length of the table. The under surface of the bridle, and of its wings, answers to the plane of the fore surface of the table, to which it is fastened. The length of each wing is about two inches and a half; their breadth is five sixths, and their thickness a quarter of an inch. The length and thickness of its arched part are equal to those of the wings. The bending of that part is such as is represented at *g d r q h*, Fig. 26. The distance *g h* between the two wings is one inch and eleven twelfths. The greatest width of the bridle, from outside to outside, as at *d q*, is two inches and three fourths; and, lastly, the upper surface of its highest part *r*, is one inch and two thirds above the upper surface of the table.

The use of these two bridles is to receive the end of the bar, which will be described hereafter. This bar is seen at *x d*, Fig. 1, Plate X. where one of the rings appears towards *d*. A wooden wedge *o t* (Fig. 24. plate XI.) is slipped, if there be occasion for it, between this bar and the table, to which last it is fastened by a single flat-headed screw *t*, around which it turns, as around a center. The shape and extent of this wedge is such as is here represented according to the scale. Its thickness, throughout, is seven twelfths of an inch, excepting only at the part *r o e*, where its upper surface inclines from *r*, to *o e*, in such manner, that the edge *o e* is almost sharp, that it may slide, like a wedge, under the end of the abovementioned bar, which passes through the two bridles or belts. The length of this piece is five inches and one twelfth, from the center *t*, to its end *o e*. This center *t* is six inches and one sixth from the edge D F of the table, and four inches and a quarter distant from the middle line *l b*. We shall hereafter see, that the bar which enters into the two belts now described, ought not to fill entirely the belt *a b c*, Fig. 26. but should leave room to introduce under it the wedge just spoken of, which is not to be inserted but when it is intended to make the other end of the bar press hard upon the axle-tree of the fore-carriage, which should never be done at the time of sowing, unless the husbandman would scarcely bury the seed.

Of the two Pipes of the Shares of the Beams, Plate XI.

Through the two holes M and N of the table (Fig. 24.) pass two brass pipes, which descend to, and open at, the back of the shears fastened in the mortises A and B of the two beams. These pipes are seen at *d* and *f* in Fig. 1. from whence they pass through the two holes in the table, and terminate behind the two shares D and K, as is represented in perspective in Fig. 29. These two pipes *f p a i k*, and *o r n l*, (Fig. 29.) are perfectly alike. They are almost square during their whole length; wider towards the end *f d*, than towards the end *k*; and they are made of plates of brass, somewhat less than a twelfth of an inch thick, well soldered together. Their opening at *f d* forms a parallelogram, which is an inch and one sixth wide from *b* to *f*, and an inch and three quarters long from *b* to *d*. The plane or perpendicular projection of these openings in the table, is indicated in Fig. 24. by the pricked lines between the letters M and N, where it is to be observed, that they are both equally distant from the middle line *l b*, and an inch and a half from the edge D F of the table. All the rims of these openings, *f*, *b*, *d*, *b*, *o*, (Fig. 29.) are nearly parallel to the upper surface of the table, above which they rise two inches and two thirds. As these two pipes are alike, and situated in the same manner, one on the right, and the other on the left hand side of the drill, it will be sufficient to apply to one of them, what remains to be said of both. This pipe runs in a strait, but oblique line, from its opening *f d* to *i*, directly behind and under the share, from whence its direction becomes perpendicular, to its other opening *k*, which is at the height of three inches and a quarter from the bottom *g* of the share. From its bending at *i*, to the opening *k*, is three inches. This opening *k* is a square, of which the sides are two thirds, or three quarters of an inch long.

This pipe is held to the side *p* of the hole, by a piece of iron which is under the table; and it is also fastened near the bending *i*, by another piece of iron fixed under the beam. These fastenings are seen in Fig. 30. which represents, in perspective, the bottom C D of the table, E F of the beam on the right-hand side of the drill, and the share G which is fastened to it. *q l* is the upper opening of the pipe, which runs from thence close to the side *a b* of the hole in the table, where it is fastened by a plate of iron, *n x*, about one eighth of an inch thick. In this plate is a notch which fits close to three sides of this pipe. This plate is fastened to the under surface of the table, by two flat-headed screws, *x* and *n*. The pipe continues in the same direction from its upper opening *q l*, to its bending at *e*, behind the share; but from thence to *f*, it follows the direction of the back of this share. It is fastened towards this bending by an iron square, *k i b g*, the thickness of which is about one eighth of an inch. This square is fastened under the beam by two flat-headed screws, *k* and *i*, and to the pipe by two other screws, *g* and *b*, the ends of which screw into a piece of iron, which is soldered to the pipe, and which is seen between the square and the pipe, from *f* to *e*. The beam A B has a shallow notch at *d*, to make room for the passage of the pipe.

Of the Pipe of the middle Share, Plate XI.

The two pipes which terminate behind the two shares fastened near the ends of the beams at Q and R (Fig. 2, Plate X.) have now been described. A third pipe, of nearly the same form, terminates behind the third share, which is fastened at P, in the piece K L. This is the pipe which passes between U and *y*, in order to its terminating behind the share *e* C.

This piece K L is represented in perspective at A B, Fig. 31, Plate XI. which shews its right side, with its share C, and the portion of the middle of the table, where are the two holes D, E, through which pass the two pipes beforementioned.

This third pipe is made like the two others, of plates of brass, of the same thickness and the same shape. Its opening *b l* forms a parallelogram of nearly the same size as the similar openings of the two other pipes. The plane of this opening, or its perpendicular projection, upon the table, is indicated by pricked lines near *o c e*, Fig. 24. where it is to be observed, that the middle of this parallelogram is in the middle line *l b* of the table, and that its side *c e* is five inches and five twelfths distant from the edge D F of the table. The rims of this opening *b l* (Fig. 31.) are raised about two inches above the upper surface of the table. From thence this pipe descends in a strait, but oblique line, towards the share which is behind the table; and at the same time bears to the right to *d* and *c*, where it bends, in order to take the direction of the lateral surface of the piece A B, against which it rests. From thence it continues in this direction to *r*, where it bends again, to *p*, immediately behind the share; and there it is bent again, so as to descend perpendicularly behind this share, down to *k*, which is within three inches and a quarter of the bottom of the share G.

The table is notched at H, to let in one side of the pipe. This notch is also seen at R, in Fig. 24. The pipe is fastened in this place by an iron plate *e f*, Fig. 31. about one eighth of an inch thick, which is fixed upon the table by two flat-headed screws near *e* and *f*. This piece is represented by itself in Fig. 32. *m n*, Fig. 31. is a piece of iron, at least one sixth of an inch thick, fastened by two screws, at N, against the side of the piece of wood A B, into which the thickness of this iron is let, as may be seen at *m*, in such manner that the outward surface of this piece *m n*, is level with that of the piece of wood A B. The pipe is fastened against this piece of iron *m n*, by a belt fixed by two screws to the piece of iron *m n*. This belt is represented by itself in Fig. 33.

Of the Standards, *Plate* XI.

In the notches Æ W at the two ends of the table, Fig. 2. Plate X. are placed two standards, represented in perspective in Fig. 34. Plate XI. with the two ends of the table, of which the middle is suppressed, as needless in this representation. These two standards being exactly alike, it will be sufficient to describe one of them.

In each standard may be distinguished three parts, namely, the head, which reaches from the line *p a*, to the top of the moulding *b d s*; the base, which extends from the top *b d s* of the moulding, to the under part of the shoulder *f u q*; and the tail or tenon, which begins at the bottom of the shoulder.

All the sides of this standard are at right angles to each other, excepting only the two indentures *p* and *a* in the head, and the mouldings at the base. The inner surface A B, which faces the other standard, is every where an even plane.

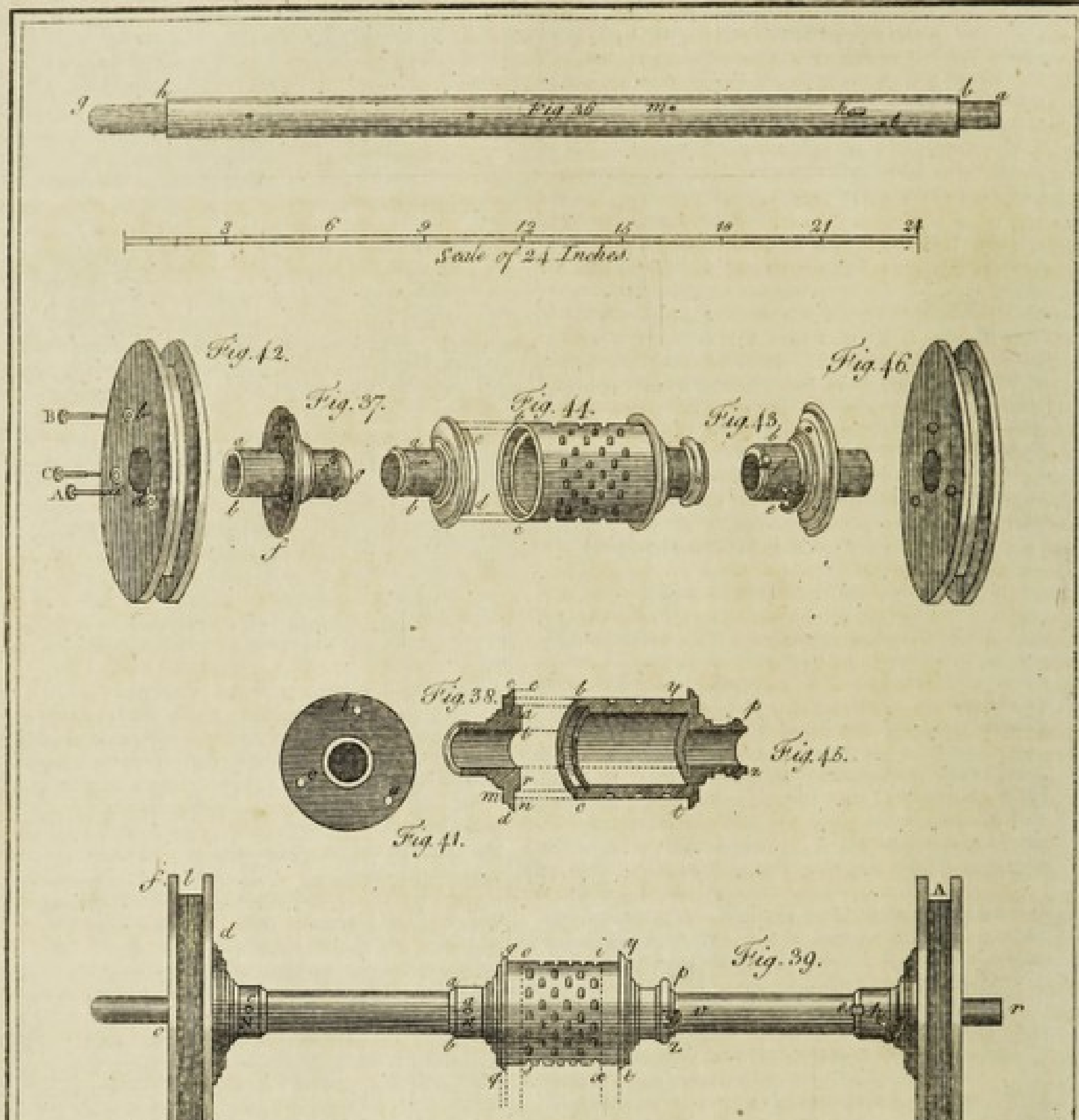
The head is three inches and a quarter wide, from *b* to *d*; two inches and one sixth thick, from *d* to *s*; and seven inches high, from the line *b d* to the line *p a*.

The base is four inches and five sixths wide from *f* to *u*; two inches and five sixths thick from *u* to *q*; and two inches and a half in perpendicular height from *f u* to *b d*.

The tail or tenon, which proceeds from the lower middle of the base, is equal in breadth *g h*, to the breadth *u q* of the base, that is to say, it is two inches and five sixths wide. Its length, *t g*, is six inches and a quarter. Its thickness is the same as the width P L (Fig. 24.) of the notch in the end of the table, which receives this tenon; that is to say, one inch and seven twelfths. The hole or mortise *k n* is in the middle of the breadth of the tenon, and forms a right angled parallelogram, two inches long from *m* to *k*, and eleven twelfths of an inch wide from *n* to *m*. The height of this hole is determined by the thickness of the table, in such manner, that the distance between the bottom *f u q* of the base, to the top *n m* of the hole, is somewhat less than the thickness of the table.

Each standard is fastened to the table, as may be seen in the figure, in the same manner as a common turning lathe is fastened, by a key D, about eight inches and a half long, driven tightly up to its middle, in that part of the mortise which is under the table; and for greater solidity, one of the keys is put in at the fore part of one mortise, and the other at the hind part of the other.

A round hole, one inch and five twelfths in diameter, is bored through the head of the standard, near A. The center or axis of this hole is exactly in the middle of the breadth of the head, and the hole is made through it exactly horizontal to the upper surface of the table, or, in other words, perpendicular to the side of the standard. The pipe *n o* of the ferrule, Fig. 35. is put into this hole. The diameter of this pipe is the same as that of the hole. The pipe *n o*, is of one piece with its scutcheon *a b d*, which



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which is one-third of an inch thick: its breadth *ab* is one inch and five-sixths, and its length *bd* is three inches. All its surfaces are at right angles, and parallel to each other. The axis of this pipe is in the middle of its scutcheon, and perpendicular to its surface. Both the scutcheon and the pipe (being but one piece) are bored through with the same hole, which is five-sixths of an inch in diameter; and in the upper surface of the inside of this hole is a grove, which reaches from one end to the other. One end of it is seen at *n*, and its use will soon be shewn. The end *no* of this pipe is put into the hole A of the standard (Fig. 34,) at the inner side A B of this standard, and the scutcheon *abd* (Fig. 35,) is let into this surface at *ci* (Fig. 34,) where it is fastened by two screws, of which the ends are seen at *c* and *i*, in this figure, and at *e* and *r* in the adjoining representation of the outside of the other standard. The two small holes in the schutcheon are female screws, to receive the ends of the screws before mentioned, which are one-third of an inch in diameter, and their heads is two thirds. The outer surface *ci* of the scutcheon is made to lie exactly even with the inner surface of the standard, and the centre of its pipe is at the perpendicular height of five inches, and seven-twelfths above the surface of the table. These two pipes (one in each standard) are destined to receive the two pivots *ab*, *gh*, of an iron axis; and the groove *n*, (Fig. 35,) then becomes useful, by affording the means of introducing a little oil, to keep the pivots from losing their temper by their friction, and to make them turn with the greater ease.

The scutcheon and its pipe should be cast in one piece of good metal, sufficiently hard, but by no means brittle.

Of the Axis, and the Pieces which are fastened to it, Plate XII.

The pivots are of the same diameter as their holes; and their shoulders *b* and *h* (Fig. 36,) are at the same distance from each other as the inner surfaces of the standards, that is to say, two feet.

The axis is represented naked in Fig. 36; but the several pieces represented separately in figures 37, 38, 40, 41, 42, 43, 44, 45, and 46, are to be fastened to it.

Fig. 39, represents all these pieces fixed upon the axis. It is to be observed here, that the long pivot *c* (Fig. 39,) goes through the hole of the standard which is on the left-hand side of the drill, and the pivot *r* through the standard on the right-hand; so that all these figures exhibit a front view of the axis and its pieces.

The pivot *ab* (Fig. 36,) on the right-hand side, is one inch and a quarter long; and that on the left, *hg*, about two inches. The diameter of the axis towards the shoulder *b* and *h* is one inch and a twenty-fourth part of an inch. From thence it thickens gradually to near the middle of its length, in order to facilitate the fixing of the pieces which are to be slipped on, over its two ends. In the middle, its diameter is one inch and an eighth.

The first piece which is slipped over its end *g* (Fig. 36,) is represented in perspective in Fig. 37: a section of it is seen in Fig. 38, and it appears in profile at *gabq* in Fig. 39. It is a hollow cylinder, of which the outer diameter *ab* (Fig. 37,) is one inch and thirteen twenty-fourths of an inch. It has a shoulder, of which the total diameter *cd* (Fig. 38,) or *gq* (Fig. 39,) is three inches and five-twelfths. Its thickness from *a* to *b* (Fig. 38,) is seventeen twenty-fourths of an inch; and the thickness *nm* of the shoulder is one-sixth of an inch. This hollow cylinder and its shoulder are made of the same piece of brass, cast in a mould, and afterwards turned. The diameter of the hollow of this cylinder is the same as that of the middle of the axis, upon which it goes very tightly, and is fastened, as in Fig. 39, by a riveted pin *n*, one-sixth of an inch in diameter, which passes through the axis and the cylinder. This cylinder is placed in such manner that its rim *ab* is eight inches and fifteen twenty-fourths of an inch distant from the shoulder *c* of the axis Fig. 39, or from the shoulder *h* (Fig. 36.)

After this cylinder is firmly fixed, another hollow cylinder, represented in perspective in Fig. 40, is forced over the end *g* of the axis Fig. 36. Its end *g* is put on first, and forced forward, till the edge of its other opening *ab* (Fig. 40,) is about a twelfth part of an inch beyound the shoulder *b* of the axis Fig. 36. The reason for putting it thus a little beyond the shoulder *b*, is, that it may not touch the pipe of the standard when it turns.

This cylinder (Fig. 40,) has, nearly in the middle of its length, a shoulder, of which the flat side *fd*, which is also represented in full view in Fig. 41, forms a circle perpendicular to the axis of the cylinder. This circle or shoulder is four inches in diameter, and a quarter of an inch thick towards its edge; but it is thicker towards the middle, as is seen in its profile at *d* (Fig. 39.) The whole length of the cylinder between its two ends *ab* and *g* (Fig. 40,) is three inches; and the diameter of its thickness at each end, *ab* and *c*, is one inch and five-twelfths: the length *na*, from the end *ab* to the flat side *df* of the shoulder, is one inch and nine twenty-fourths.

This cylinder and its shoulder are of one piece of brass, cast in a mould, and turned in a turner's lathe. When put upon the axis, over which it goes very tight, in such manner that, as was said before, its end *ab* (Fig. 40,) is placed about a twelfth part of an inch within the shoulder *b* of the axis (Fig. 36,) it is fastened by a pin which goes in at the hole *c* (Fig. 40,) and passes through the axis. This pin, waich is of iron, and one-sixth of an inch in diameter, goes tight through the cylinder and the axis, without projecting at either of its ends. This cylinder is represented as pinned at N (Fig. 39.)

Fig. 42, is a wooden pully, of which a part is seen at P (Fig. 1, Plate X.) and of which the hole in its centre is of the same diameter as the end *ab* of the cylinder (Fig. 40, Plate XII.) This end of that cylinder is put through this pully, which is every where one inch and a quarter thick, that is to say, somewhat less than the length of the end *na* of the cylinder (Fig. 40;) so that when the pully is put upon the cylinder, and its side is placed against the shoulder *df*, the end *ab* of the cylinder projects a little beyond the other side of the pully, to prevent its rubbing against the adjoining standard. This pully is represented in profile at *lm* (Fig. 39.) Its extreme diameter, *fk*, is eight inches; and its groove *lm*, which is square, is an inch and a quarter deep, and three quarters of an inch wide. This pully is placed close to the brass scutcheon, to which it is fastened by three screws A, B, C, (Fig. 42,) which screw into the three holes *a*, *b*, *c*, (these being female screws) in the flat part of the shoulder (Fig. 41,) of the cylinder (Fig. 40.) Each of these screws (Fig. 42,) is from a quarter to a third part of an inch in diameter; and their head, which is flat, is about a quarter of an inch thick, and two-thirds of an inch in diameter. These heads are screwed into the holes *ab* and *c*, till they lie even with the surface of the pully on that side.

To the other end *b* of the axis (Fig. 36,) is fitted exactly, though so as to slip on with ease, a third hollow cylinder (Fig. 43,) of which the profile is seen at *b* (Fig. 39.) It is like that which is marked N *d* at the other end of the axis; with this only difference, that the extreme diameter of the end *be* of the cylinder (Fig. 43,) is about two inches. This cylinder is fastened to the axis by a thumb-screw *e*, which goes through a female screw in the cylinder, and of which the end enters into the hole *l* in the axis (Fig. 36,) which is not a female screw: and that the end of the screw may be directed to this hole, without any difficulty, when the cylinder is upon the axis, this last is provided with a small tongue *k*, which goes exactly into the notch *f*, (Fig. 43,) as is seen at *e*, (Fig. 39.)

A pully exactly like the former is fastened to the shoulder of this cylinder, by three similar screws, and in the same manner: observing equally here, that the outer surface of this pully do not rub against its adjoining standard. This pully is seen at Q, (Fig. 1, Plate X.)

It

It is ſometimes neceſſary to take this pully and the cylinder off from the end *r* of the axis (Fig. 39,) which is the reaſon why this cylinder is faſtened by a ſcrew, and not by a pin, like the other. They are taken off, to make room for putting upon the axis the cellular cylinder, which is of caſt braſs, and turned in a lathe.

Of the cellular Cylinder, *Plate* XII.

This cylinder is ſeen in profile, upon the axis, at *p*, *y*, *g*, *q*, *t*, *z*, (Fig. 39,) and in perſpective in Fig. 44. Fig. 45 repreſents its longitudinal ſection. The part of this cylinder which is between the two lines *y t* and *p z*, (Fig. 39) is exactly like the above deſcribed cylinder Fig. 37 and 38, and *g*, *a*, *b*, *q*, (Fig. 39.)

The only difference between them is, that the one is fixed permanently to the axis, by a pin *n*, (Fig. 39;) and the other is faſtened by a ſcrew *v*, which paſſes through a female ſcrew near the end of the cylinder, which is ſtrengthened there for that purpoſe, by a moulding or collar *p z*. The end of this ſcrew enters into a hole *m* in the axis (Fig. 36;) but this hole is not a ſcrew. The other part of the cellular cylinder included between the two lines *y t* and *g q*, (Fig. 39,) is three inches and five-twelfths long; its outward diameter, throughout this length, is two inches and twenty-one twenty-fourths of an inch: and its inner diameter is two inches and a third. This inner diameter is a little wider towards the end *b c* of the cylinder, (Fig. 44 and 45.) It is exactly the ſame as the outer diameter of the projecting part *c d* of Fig. 37, which is to go into, and fit cloſely to, the end *b c* of the cellular cylinder, (Fig. 44;) ſo that the edge of this end *b c* may run quite up to the flat ſide of the ſhoulder of Fig. 37. The pricked lines in Fig. 45 and 38, are intended to expreſs the correſpondence of the parts of theſe two cylinders, which are to be united, by putting the end of one into the end of the other. Fig. 39 ſhews the cellular cylinder joined to the ſhoulder of the other cylinder: in which poſition it is that the cellular cylinder is faſtened to the axis by the ſcrew *v*, as before ſaid: and that the end of this ſcrew may be directed ſtrait to the hole in the axis, whenever this cylinder is put on, two contiguous lines or marks may be made, one upon the edge *p z* of the cylinder, and the other upon the axis.

Of the Cavities of the cellular Cylinder, *Plate* XII.

On the ſurface of this cylinder, between the lines *y t*, and *g q* (Fig. 39,) are ſcooped hollows or cavities, repreſented at large in Fig. 47, N°. 1, and ſeen in profile in Fig. 47, N°. 2. They are ſhaped nearly like a niche, which terminates in a cone at its top, and is rounded gradually deeper and deeper down to its bottom, which is a flat, perpendicular to the loweſt part of the cavity.

To conceive and fix the poſition of theſe cavities upon the cylinder, the two pricked lines *i x*, *o s* (Fig. 41,) muſt be drawn round the cylinder, at equal diſtances from the lines *y t*, and *g q*, and diſtant from each other two inches and one-third, which is the inner breadth of the ſeed-box in which the cylinder is placed, as will be more particularly explained in the deſcription of it.

The breadth between the lines *i x*, and *o s*, muſt then be divided into ſix equal ſpaces, by five other parallel lines drawn round the cylinder. Each of theſe ſpaces marks the width of each row of cavities; and the ſix rows of cavities muſt face exactly the ſix valves of the bin, which will ſoon be ſpoken of.

After this, the places muſt be marked for twelve ſimilar cavities, placed at equal diſtances from each other, in each of the breadths traced round the cylinder; obſerving, that the length of the cavities is to be in the ſame direction as thoſe breadths; and alſo, that the flat end of each cavity muſt be undermoſt, and the rounded end uppermoſt, when the cylinder fronts the fore-part of the drill, which is the view repreſented in Fig. 39; for it is the flat end of the cavities that is to go foremoſt, when the cylinder turns and drops the ſeed.

It is likewiſe to be obſerved, that each cavity ſhould be oppoſite to the interval between two cavities in the next adjoining rows, as they are placed in Fig. 39, 44, and 47.

It will be right to have two or three, or even more, cellular cylinders, equally fitted to the axis (Fig. 39,) but with cavities of different ſizes, in order to be thereby enabled either to ſow more or leſs ſeed, or ſmaller or larger ſeeds, ſuch as barley, lentils, peaſe, beans, millet, oats, &c. for each of which its proper cylinder ſhould be uſed.

The cavities in Fig. 47, N°. 1 and 2, are of a ſize fit for wheat, barley, lentils: for millet, they muſt be much ſmaller; for peaſe, ſomewhat deeper; for oats, there ſhould be but eight or nine cavities in each row, in order that thoſe cavities may be made longer than for wheat, on account of the length of the oat, which is the only ſeed that I have found leſs eaſy to ſow than wheat: the reaſons are, the lightneſs of oats, their not ſlipping eaſily between each other, and their having at one end of the grain a pretty long, flexible, and elaſtic point. Theſe obſtacles ſometimes hinder the grains from entering into the cavities, and the ſeedſman muſt be more careful when he ſows oats, than when he ſows any other kind of grain; though, notwithſtanding theſe difficulties, I have had them ſown pretty well.

To ſow beans, the cylinder muſt have but three rows of cavities, of a length, breadth, and depth proportioned to the ſize of the beans. The bin, which has ſix valves for wheat, ſhould have but three for beans, and theſe valves ſhould be proportioned to the breadth of the cavities, which muſt be placed exactly oppoſite to them, as for wheat.

The following rule will determine the proper ſize of the cavities, by applying, as may eaſily be done, what is here ſaid of wheat to any other kind of grain.

The cavities muſt be large enough to contain three or four grains of wheat, and their depth muſt be ſuch that theſe grains do not riſe above the ſurface of the cylinder, in order that when the cavities filled with ſeeds, paſs under the valves of the bin, the grains may not fall out of the cavities. This will be ſtill better underſtood, after reading the deſcription of the ſeed-box.

Of the Seed-Box, *Plate* XII. *and* XIII.

After unſcrewing and taking off from the axis, the pully A B (Fig. 39) its cylinder *b*, and the cellular cylinder *p z*, *g q*; the ſeed-box (Fig. 48,) is placed upon the axis, by running the bared end of this laſt through a round hole in each of the two parallel ſides of the ſeed-box. The diameter of theſe holes is the ſame as that of the cellular cylinder, which is then to be put over the axis, by paſſing its proper end through the hole in the ſide of the ſeed-box, which it traverſes, and faſtening it in the manner before directed. The pully is alſo then to be replaced. The front of this box is ſeen at B (Fig. 1, Plate X.)

Fig. 49 repreſents the box and the cellular cylinder placed upon the axis, where it is to be obſerved that the outer breadth of the box, expreſſed by the interval between the lines *d e* and *k l*, is exactly the ſame as the length of the cylinder expreſſed in Fig. 39, by the diſtance between the lines or ſhoulders *y t*, and *g q*; ſo that the box is held between theſe two ſhoulders *y t*, and *g q*. It is alſo to be obſerved, that the inner breadth of the box, expreſſed by the interval between the lines *f g*, and *h i*, in Fig. 49, is exactly the ſame as the length of the cylinder expreſſed by the lines *i x*, and *o s*, in Fig. 39.

This braſs-box has neither cover nor bottom, but is formed of four plates, each five twenty-fourths of an inch thick. Fig. 50 repreſents the inſide of the plate F G, (Fig. 48,) which is on the left-hand ſide of the drill, with the pieces which the box contains, and a ſection of the cylinder, lengthways of one of the rows of cavities. Fig. 51 repreſents the outſide of the plate oppoſite to the former, and which conſequently is on the right-hand ſide of the drill.

These two plates (Fig. 50 and 51,) are exactly equal. Each of them forms a parallelogram, of which the length A B (Fig. 50 and 51,) is four inches and eleven

twelfths,

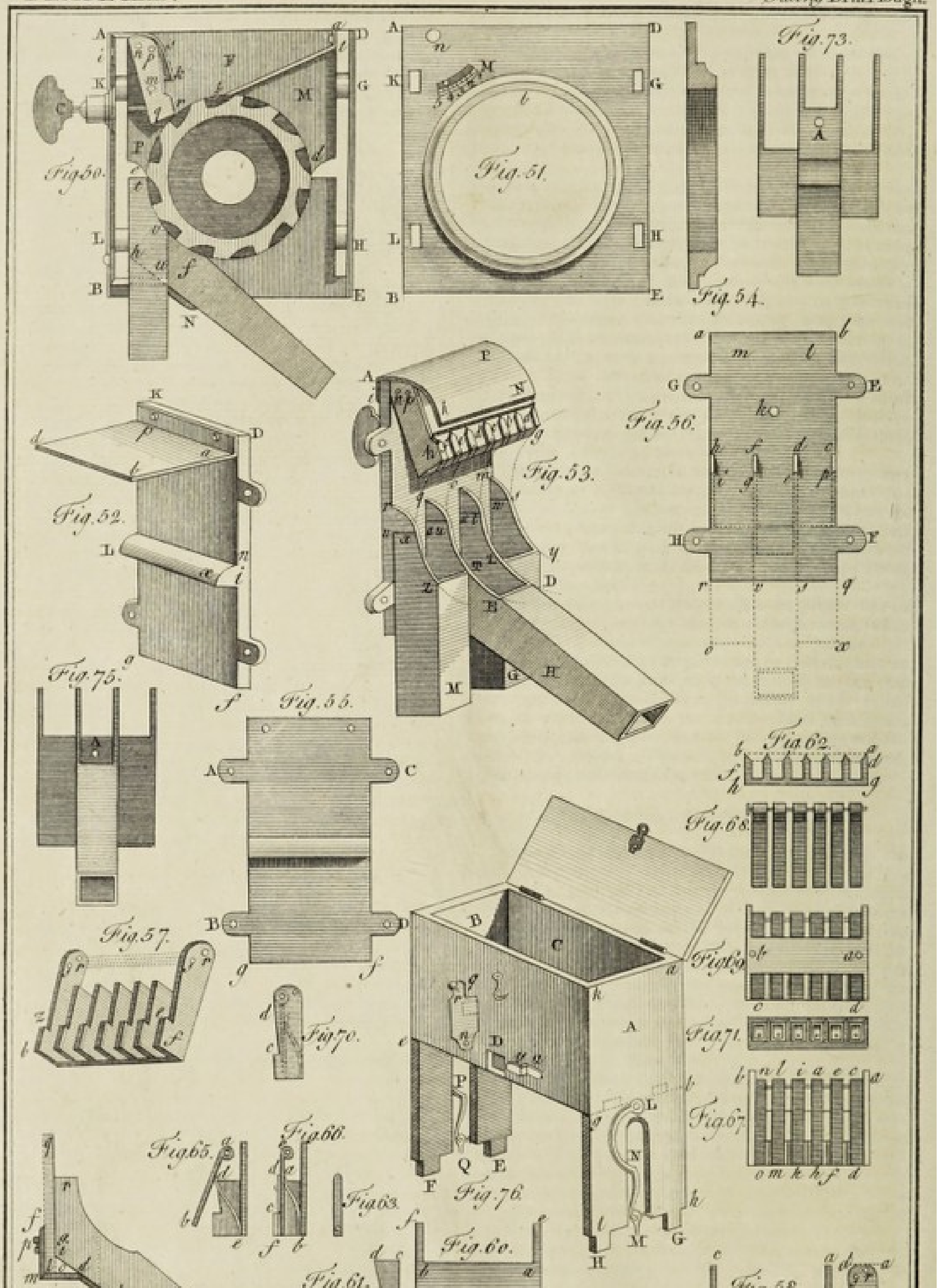


Fig. 50.
Fig. 51.
Fig. 52.
Fig. 53.
Fig. 54.
Fig. 55.
Fig. 56.
Fig. 57.
Fig. 58
Fig. 60.
Fig. 61.
Fig. 62.
Fig. 63.
Fig. 64
Fig. 65.
Fig. 66.
Fig. 67.
Fig. 68.
Fig. 69
Fig. 70.
Fig. 71.
Fig. 73.
Fig. 74.
Fig. 75.
Fig. 76.
Inches.
Scale for Fig. 50. 51. 54. 55. 56. 58. 59. 60. 61. 62. 63. 64.
65. 66. 67. 68. 69 . 70. 71. 72. 73. 74. 75 & 90.
J. Hulett Sculp.

twelfths, and the breadth B E four inches and fifteen twenty-fourths. Both of them are perforated by a large round hole, of the fame diameter as that part of the cylinder in which are the cavities. The centre of this hole is in the middle of the breadth of thefe plates, and the upper extremity *b*, of this hole (Fig. 50 and 51,) is an inch and one-fixth diftant from the upper edge, D A, of the plate. Both the plates have four mortifes, G, H, K, L, (Fig. 51,) the breadth of which is equal to the thicknefs of the plates, and the length about half an inch; though this laft is almoft arbitrary. Both of them have alfo, directly facing each other, a hole at *n* (Fig. 50 and 51,) three twenty-fourths of an inch diameter, and of which the centre at the diftance of five twenty-fourths of an inch from the line D A, and half an inch from the line A B. The inner furface of both the plates is even; and laftly, each of them has, on its outer furface, a fhoulder which projects round the rim of the great hole. One of thefe fhoulders is feen in perfpective in Fig. 48. The profile of one of them is feen between the lines *d e* and *f g* (Fig. 49,) and that of the other between the lines *h i* and *k l*. Fig. 54 reprefents a fection of them both. The thicknefs of this fhoulder, that is to fay, the diftance to which it is to project, has already been determined by the total diftance between the lines *y t* and *g q* (Fig. 39.) When the inner furfaces of thefe two plates (Fig. 50 and 51,) are laid againft each other, their edges and holes, now defcribed, fhould coincide exactly.

What they differ in is, firft, that one of them (Fig. 51,) has a fmall opening M N, which the other has not, and which will be defcribed in its proper place; and fecondly, that the hole *n* (Fig. 50 and 51,) is a female fcrew in Fig. 50, to receive the end of a fcrew which traverfes the box, but is not wormed in that manner in Fig. 51, where the outfide of the plate is hollowed a little around this hole, to make room for the flat head of this fcrew, which will be fpoken of hereafter.

The two plates now defcribed are fixed in their proper places by means of two others (Fig. 55 and 56,) which laft are of equal fize with each other. D E (Fig. 50,) is the profile of Fig. 55, which is the back of the box; and A B (Fig. 50,) is the profile of Fig. 56, which is the front of the box reprefented at A (Fig. 48 and 49.)

The two tenons A and B (Fig. 55,) enter into the two mortifes which are hid near G and H in Fig. 50. The two other tenons C and D (Fig. 55,) are expreffed near G H in Fig. 50, and receive the mortifes G and H of Fig. 51. In like manner the two tenons E and F of Fig. 56, enter into the mortifes hidden near K and L in Fig. 50, where are marked the two other tenons, likewife feen at G and H in Fig. 56, which are to receive the mortifes K and L of Fig. 51. The diftance between the tenons of the fame fide of a plate, and confequently between their mortifes, is arbitrary; as is alfo the length of the tenons, which are pierced, in order to their being fixed very tightly by pins about the twelfth part of an inch thick. Thefe two plates (Fig. 55 and 56,) when rightly placed between the other two plates, fhould be perpendicular to them, aud parallel to each other, as well as to the lateral edges of thofe other plates, and the diftance between them, from infide to infide, fhould be four inches. The upper edges of the four plates, when they are put together, fhould be horizontally level; by which means the bottom of the two largeft plates will reach lower down than the fmaller. Thefe two fmaller plates (Fig. 55 and 56,) are fhaped like a parallelogram two inches and a third wide, and four inches and thirteen twenty-fourths long. This breadth anfwers exactly to the fpace between the lines *i x* and *o s*, (Fig. 39,) and between the lines *f g* and *h i*, (Fig. 49.)

The plate (Fig. 55,) which is feen in perfpective in Fig. 52, has, quite acrofs its inner furface, a folid plint *x* L, which is of the fame piece as the plate, and runs parallel to *f g*, (Fig. 52 and 55.) The bottom of this plint is flat, and its top is arched like a portion of a circle. Its thicknefs from *i* to *n* is nine twenty-fourths of an inch, and its projecture *i x*, (Fig. 52,) is fuch that its edge *x* L meets the furface of the cellular cylinder, as in the profile *d* (Fig. 50.)

The ufe of this plint is to ftrengthen the affemblage of the plates; for which purpofe its ends *x* L, (Fig. 52,) fhould join exactly to the larger plates: and it ferves likewife to prevent the grains of corn from flipping down between the plate and the cellular cylinder.

To the top of the infide of this plate is faftened, by two fcrews *a* and *p* (Fig. 52,) a plate of brafs one-twelfth of an inch thick. Its extent *a*, *p*, *d*, *b*, is a rectangle parallelogram, of which the breadth *a p*, or *d b*, is the fame as that of the plate to which it is faftened; fo that its edges *a b* and *p d* lie clofe to the infides of the two largeft plates (Fig. 50 and 51.) The profile of this plate is feen at *a l b*, (Fig. 50,) where it is inclined from *l* to *b*, in fuch manner that the whole length of its edge *b d*, (Fig. 52,) is almoft clofe to the furface of the cylinder, directly above its axis, as in the profile *b*, (Fig. 50.) But this plate muft not quite touch the cylinder, becaufe it would then obftruct its motion, or at leaft occafion a needlefs and detrimental friction. Its ufe is to hinder the corn which fills the fpace F, from falling down into the fpace M, and to make it pafs only under the piece *r q* (which will foon be defcribed) to drop from thence into three pipes, which begin near *e*, as will be feen hereafter.

The plate Fig. 56, (feen in perfpective in Fig. 53, with fome pieces fixed to it) has, rifing upon its inner furface, four, exactly fimilar fmall partitions, which are of a piece with the plate. Thefe four partitions *c p*, *d e*, *f g*, *h i*, (Fig. 56,) are feen in perfpective at *m s*, *o t*, *q v*, and *r x*, in Fig. 53. The top *r x* of all thefe partitions is rounded like the quarter part of a circle, and the bottom *x v* is flat, and at the fame height as the axis of the cylinder, as may be feen in the profile *e* of one of thefe partitions (Fig. 50.) The two outer partitions *c p* and *h i*, (Fig. 56,) are at the edges of the plate, and the two others *d e*, *f g*, divide the fpace between *c* and *h* into three equal parts. Thefe partitions are about a twelfth part of an inch in thicknefs, and their rounded part terminates in an edge, that the grains which may chance to fall upon it may not lodge there. The height *u r*, (Fig. 53,) or *i h*, (Fig. 56,) of all thefe partitions, is nine twenty-fourths of an inch. The lower ends *s w*, *t æ*, *v a*, *x u*, (Fig. 53,) of all thefe partitions, are in a plane perpendicular to the plate, and parallel to the edges *b a*, *q r*, of this plate (Fig. 56.)

This plate has alfo upon its outer furface a fmall cylinder, which is feen in profile at K, (Fig. 50,) in front at A, (Fig. 49,) and in perfpective at A, (Fig. 49,) and B, (Fig. 1, Plate X.) Its whole length is two-third of an inch, and its diameter is half an inch, excepting its fhoulder at the plate, which is a little more. This cylinder is pierced lengthways with a female fcrew, which goes through the plate perpendicularly to its furface, and through which paffes a fcrew C *q*, (Fig. 50,) five twenty-fourths of an inch in diameter, of which the end is feen at *q*, and the head at C. This head is alfo feen at B, (Fig. 1, Plate X.) The hole is feen at *k* (Fig. 56,) in the inner furface of the plate. The centre of this hole *k* is in the middle of the breadth of the plate, and at the diftance of five twenty-fourths of an inch from its edge *a b*. This fixes the place of the fcrew and of its cylinder; the only ufe of which laft is, by its length, to give the greater ftability and firmnefs to the fcrew, which keeps the bin at a greater or lefs diftance from the cellular cylinder.

Of the Bin and its Valves, Plate XIII.

The bin, which has fix valves, is feen in profile at *q n*, (Fig. 50.) The outfide of this bin is feen in perfpective at *g h n*, (Fig. 53,) with the ends of the valves *a*, *b*, *c*, *d*, *e*, *f*, feparated from each other by partitions. It is fufpended in the box by the axis or fcrew beforementioned (Fig. 50 and 51,) which goes in at the hole *n* in the end (Fig. 51) of the box, then paffes through the hole *n* of the bin (Fig. 50 and 53,) runs quite through the length of the bin, and fcrews into the female fcrew in the plate (Fig. 50,) which, as was faid before, is directly oppofite to the hole *n* in the plate (Fig. 51.) The head of this fcrew, at *n* (Fig. 51,) lies even with the outer furface of this plate.

Fig. 57 repreſents in perſpective the bin alone and its partitions, all made of one piece, or plate of braſs. Fig. 58 repreſents geometrically the fore-part of the bin, which is here turned towards the ſeedſman. Fig. 60 repreſents its back. Fig. 62 its bottom. Fig. 59 one of its utmoſt ſides, or largeſt partitions, both of which are equal and alike. And Fig. 61 the ſide or profile of one of the ſmaller partitions, which are all equal and like to each other.

The whole length of the bin from outſide to outſide, that is to ſay, from *a* to *c*, and from *b* to *d*, (Fig. 58,) or from *c* to *d*, and from *e* to *f*, (Fig. 60,) is the ſame as the breadth of the inſide of the box, or of the ſpace between the lines *i x* and *o s*, (Fig. 39.) or *f g* and *h i*, (Fig. 49.) The bottom of the bin is a parallelogram *s*, *k*, *d*, *b*, (Fig. 58,) or *a*, *b*, *d*, *c*, (Fig. 60,) eleven twenty-fourths of an inch wide at *a c* and *b d*. This bottom is of the ſame thickneſs as the largeſt partitions or ſides *a b*, *c d*, (Fig. 58,) and the five ſmaller partitions; that is to ſay, three twenty-fourths of an inch. Theſe partitions, both great and ſmall, are at equal diſtances from each other, and all their ſides are perpendicular to the bottom of the bin.

The whole length of the two largeſt partitions, (Fig. 59,) from *b*, to the pricked line *g d*, which is perpendicular to *a b*, is one inch and ſeventeen twenty-fourths. Their breadth at *a i* and *b c* is five-ninths of an inch. The line *c m*, parallel to *b a*, is eleven twenty-fourths of an inch long. The notch *l m* is one-twelfth of an inch deep. The angle *a*, *b*, *c*, is of eighty-five degrees. The perpendicular diſtance from the centre of the hole *s*, to the line *g d*, is a quarter of an inch; and the perpendicular diſtance from the ſame centre to the line *a b*, is five-twelfths of an inch. The diameter of this hole is a full twelfth of an inch. The perpendicular diſtance from the centre of the hole *r*, to the line *g d*, is very near, but not quite, one-ſixth part of an inch; and the perpendicular diſtance from this ſame centre to the line *a b*, is five twenty-fourths of an inch. The diameter of this hole is one-ſixth of an inch. Theſe two main partitions, *a b* and *c d*, (Fig. 58,) which have now been deſcribed in the account of Fig. 59, are exactly alike, and pierced in the ſame manner; ſo that if they could be laid flat together, inſide to inſide, their dimenſions and holes would tally perfectly.

It is through the hole *r*, (Fig. 59,) that the ſcrew or axis is paſſed which keeps the bin ſuſpended to the plates, and which was mentioned before. Theſe two holes *r r* are ſeen in Fig. 57, where their axis is indicated by two pricked lines. And it is through the hole *s*, (Fig. 59,) that the ſcrew or axis is paſſed which goes through the valves, next to be ſpoken of, and by which they are ſuſpended in the bin. Theſe two holes *s s* are ſeen in Fig. 57, with their axis, which is indicated by two pricked lines.

Fig. 61 repreſents the profile of the ſmall partitions. Its total height from *ab* to *c d*, is equal to the breadth *d b* of the bottom (Fig. 60,) as is ſhewn in Fig. 58. The ſhape and ſize of theſe ſmall partitions is exactly like, and equal to that part of Fig. 59, which is included between the lines *e*, *f*, *b*, *c*; ſo that their edges would tally in all reſpects, if they were laid one upon the other. The line *c d*, (Fig. 61,) is perpendicular to *c a*.

The edge *m c*, (Fig. 59,) is a bevil, ſloped towards the inſide of the bin, as at *e f*, (Fig. 57,) and *a d*, (Fig. 62.) The like edge *z b*, (Fig. 57,) and *b f*, (Fig. 62,) is ſloped in the ſame manner. All the ſimilar edges *e b*, (Fig. 61,) of the ſmall partitions, which are included between the lines *e f* and *b d*, (Fig. 58,) are bevils on each ſide, and form as many acute edges, as is ſeen in Fig. 62, between the lines *a b* and *d f*. The diſtance between the lines *a b* and *g b*, is five-ninths of an inch.

Fig. 58 is repeated in Fig. 64, with only the addition of the ſix ſprings *a b*, *c d*, *e f*, *g b*, *i k*, *l m*, each of which is faſtened by a ſmall ſcrew, *a*, *c*, *e*, *g*, *i*, *l*, at one of their ends, next to the bottom of the bin, and in the middle of the interval between two partitions. The breadth of theſe ſprings is nearly equal to two-thirds of this interval, and their thickneſs is the ſame as that of a common ſpring of a watch, which is the ſtuff they are made of. Fig. 63 exhibits a front view of one of theſe ſprings. Their length and bending, when in a ſtate of reſt, is repreſented in the profile *c d*, (Fig. 65,) *b a*, (Fig. 66,) ſhews the profile of theſe ſprings in a ſtate of contraction.

Fig. 64 is repreſented in Fig. 67, with only the addition of the ſix valves *c d*, *e f*, *g h*, *i k*, *l m*, *n o*, ſeen in profile in Fig. 65 and 66. Each of theſe ſix valves is, at moſt, one-twelfth of an inch thick, and their total length, *a b*, (Fig. 65.) is one inch and thirteen twenty-fourths. The ſix valves, put together, weigh twenty penny-weights, or five-ſixths of an ounce. When put in their proper places (Fig. 67,) each of them covers one of the before-mentioned ſprings. The breadth of each of them is equal to the whole width of the interval between two partitions, between which they muſt only be able to move. They are all faſtened to the ſame axis *a b*, which, as was ſaid before, paſſes through the holes *s s*, (Fig. 57 and 59.) The diameter of this axis is a full twelfth part of an inch. One of its ends ſcrews at *a*, (Fig. 67,) into one of the aforeſaid holes *s*, and the other end, which has a flat head, is buried at *b*, in the other hole *s*; for which purpoſe the outſide of the plate is pared away a little, around this hole. One of theſe holes is ſeen at *p*, in Fig. 50 and 53. The valves are laid flat in Fig. 67, with their ſprings contracted, as in the profile, (Fig. 66.) When the ſprings are at liberty, they puſh the valves out of the partitions, as far as is repreſented in the profile (Fig. 65.) But they are kept within partitions, by a cover *a b*, (Fig. 69,) which is put into the notch *f m*, (Fig. 59,) and *c d*, (Fig. 61;) and, in ſhort, into all the notches, which are upon a level with each other, from *i e* to *f k*, (Fig. 58.)

Fig. 67 is repeated in Fig. 69, with only the addition of the cover, which is three quarters of an inch wide, as long as the whole breadth of the bin, and not quite a twelfth part of an inch thick. It is faſtened by two ſcrews *a* and *b*, which go into the upper edge of the large partitions, as appears in the profile (Fig. 66 and 70.) Fig. 70 repreſents one of the large partitions of the bin, with the end *c d* of its cover, and the head of one of the ſcrews which faſten it. Fig. 66 repreſents the profile of one of the ſmall partitions of a valve *e f*, of its ſpring *a b*, and of the cover *d c*. This figure ſhews alſo, that the end of the valve cloſes with the loweſt edge of the partition; as may be ſeen more diſtinctly at *d o*, (Fig. 67 and 69.)

Fig. 68 repreſents the back of theſe ſix valves faſtened to their axis.

The end of each valve, *d*, *f*, *b*, *k*, *m*, *o*, (Fig. 67,) is bent a little outward, as in Fig. 71, which is only a repetition of Fig. 62, with the addition of the ſprings of the valves, and their cover.

The whole bin, furniſhed with the ſix valves and their axis, the ſix ſprings and their ſcrews, and the cover and its two ſcrews, but not the axis or ſcrew which ſuſpends the bin in the box, weighs four ounces and a half.

The bin thus completed, and ſuſpended in the box, as was ſaid before in ſpeaking of Fig. 50 and 53, is again covered by thin plate of braſs repreſented in perſpective at *i*, A, *k*, N, P, (Fig. 53,) and of which the profile is likewiſe ſeen at *i*, A, *s*, *k*, (Fig. 50.) This plate is bent at A P, (Fig. 53,) in ſuch manner that its bended part turns inward, over the upper edge of the front of the braſs-box; and its edge, which is ſeen in profile at A *i*, (Fig. 50 and 53,) and fully at *e n*, (Fig. 48 and 49,) is faſtened to the upper part of the outer ſurface of this plate of the box, by two ſcrews *e* and *n*, which go into the holes *l* and *m*, in Fig. 56. This plate, from its bending A P, (Fig. 53,) projects over into the box, inclining down to the bin, which it covers as low as N *k*, where the cover of the bin before-mentioned ends. This plate performs the office of a ſpring, and ſhould therefore be ſcrewed on very tight. It preſſes the bin againſt the end *q* of the ſcrew *q* C, (Fig. 50.) The breadth A P and *k* N of this plate, (Fig. 53,) is the ſame as the breadth of the inſide of the box; ſo that its two edges, A *k* and P N, lie cloſe to the inner ſurfaces of the two large

plates,

plates, (Fig. 50 and 51,) which form the ends of the box.

Of the three Pipes of the Seed-Box, Plate XII. *and* XIII.

Fig. 72 reprefents a perfpective view of the three pipes, which are feen partly at B, D, E, Fig. 48 and 49, Plate XII. and at *a b*, Fig. 1, Plate X. They are made of plates of brafs, about a twelfth part of an inch thick, and are feparated from each other only by a fimple partition. Their front is feen in perfpective, and on the right-hand fide of the drill, in Fig. 72. Their back is fhewn in perfpective, and on the right-hand fide of the drill, in Fig. 53. Their front is reprefented geometrically in Fig. 49 and 73; and their back in Fig. 75. Fig. 74 reprefents geometrically, the fide or profile of the middle pipe, which is inclined with the piece that faftens it to the plate. The profile of the pipes on each fide of this is indicated by pricked lines.

Thefe three pipes, (Fig. 72,) are fet againft the plate (Fig. 56,) in fuch manner that the edges *a b*, *c d*, (Fig. 72,) are applied clofe to it, and in the fame order, at *i r*, *v g*, (Fig. 56.) The edges *g h*, *f e*, (Fig. 72,) are applied in like manner at *p q*, *s e*, (Fig. 56.) The line *b h*, (Fig. 72,) is fet exactly even with *r q*, (Fig. 56.) By this means the anterior furfaces *b c k i*, and *f h l m*, of the two outer pipes, (Fig. 72,) exceed the bottom of the box, as at BD, (Fig. 48 and 49;) and the upper edges *a n*, *d o*, *e p*, *g q*, (Fig. 72,) join to the lower edges of the four partitions (Fig. 56,) at *i*, *g*, *e*, *p*, as is feen in perfpective in Fig. 53, at *x u*, *v a*, *t æ*, and *s w*.

Thefe three pipes, which hold together, are faftened to the plate by means of a fingle brafs fcutcheon A, (Fig. 72,) which is feen directly in front at H, (Fig. 49,) and at A, (Fig. 73.) Its fore part and right hand fide are feen in perfpective at A in Fig. 72; and its fore part and left hand fide at H, (Fig. 48.) Fig. 75 fhews a full view of the back part of it at A; and the whole profile of it, on the right hand fide, is feen at N *u* B L, (Fig. 50,) and at *b d l f*, (Fig. 74.) This fcutcheon is bent at *d* and at *m*. Its breadth is the fame as that of the middle pipe, which is the interval between the other two, as is feen in Fig. 48, 49, 72, 73, 75. Its part *b d*, (Fig. 74,) is foldered or riveted to the lower furface of the middle pipe: from thence it takes an horizontal direction from *d* to *m*, and then afcends perpendicularly from *m* to *f*. This length *m d* is one inch, and the thicknefs of the fcutcheon, throughout, is about a fixth part of an inch, or fomewhat lefs. The thicknefs of the plate, Fig. 56, of which the profile is here at *q l*, Fig. 74, is exactly embraced between the extremity *r i* of the pipe, and the fcutcheon *f l*. The bottom, *q r*, (Fig. 56,) of this plate, refts upon the horizontal part *o l* of the fcutcheon, (Fig. 74;) and this fcutcheon is faftened to the plate by a fcrew *p g*, which goes into the hole *n*, (Fig. 56.) It is to be obferved, that the line *r o*, (Fig. 74,) is equal to the edges *a b*, *c d*, *e f*, *g h*, (Fig. 72,) of which it expreffes the profile; that its farther extent *o a*, (Fig. 74,) is equal to the lines *b i*, *c k*, *f l*, *h m*, (Fig. 72,) of which it expreffes the profile; and that the line *d l*, (Fig. 74,) is in the fame horizontal plane as the line *b h*, (Fig. 72.)

The angle *r*, *i*, *e*, (Fig. 74,) is of one hundred and twenty-fix degrees; and the diftance from *o* to *i* is one third of an inch. The outfide breadth of thefe three pipes, taken together, is the fame as that of the plate; and each of them occupies a third part of that fpace, as in Fig. 53, 56, 73 and 75. Each of them is fquare. The length of the two outer pipes, from the line *b h*, (Fig. 72,) or from the bottom *q r* of the plate, (Fig. 65,) to the line *i m*, (Fig. 72,) or *x o*, (Fig. 56,) is one inch and a twelfth: the length of the middle pipe, (Fig. 74,) from *i*, where it joins to the plate, to its other end *e*, is four inches and five twelfths.

Thefe three pipes are faftened to the plate, as in Fig. 53. The edges *x*, *z*, *v*, T, E, *t*, *l*, D, *s*, *y*, of their upper openings, are circular, that they may fit exactly, and fit clofe to the circumference of the cylinder, which is there indicated by pricked lines, and is fhewn in Fig. 50, by the line *t v f*, which expreffes the profile of thefe edges, againft which the cylinder rubs lightly when it turns.

Manner of working the Seed-box, and of the Pieces which it contains, Plate XIII.

The line or edge *g h* of the fix valves, (Fig. 53,) muft be very near to the furface of the cellular cylinder, tho' not quite fo clofe as to occafion a friction when the cylinder turns; and the lower end of each valve muft anfwer to a row of cavities; fo that the part F of the feed-box, (Fig. 50,) being filled with corn, and the cylinder turning from *b* to *r*, this laft carries with it the grains that fall into the cavities which pafs under the edge of the correfponding valves: thofe that fall from the two valves *a* and *b*, (Fig. 53,) are dropped, by the cavities, into the pipe G, in the fpace between the pricked lines *g s* and *b t*, and are conveyed to the back of the fhare which is on the left hand fide of the drill; thofe that fall from the two next valves, *c* and *d*, are dropped between the pricked lines *b t* and *d v*, into the pipe H, and are conveyed to the back of the fhare which is in the middle of the drill: and thofe that fall from the two laft valves, *e* and *f*, are dropped between the pricked lines *d v* and *b x*, into the pipe M, and are conveyed to the back of the fhare which is on the right hand fide of the drill.

If it happens that feveral grains prefs together at the fame time, at the outlet of any one of the valves, fo as to choak it, that valve immediately gives way, lets them pafs, and is inftantly replaced as before, by means of its fpring which pufhes it back. No grain is ever broken by the valves: fo that if this accident does fometimes happen to a few, it is not during the time of actually fowing the feed, but only when the drill is turned, in order to begin another bout, or when the feedfman, inftead of drawing the drill forward, drags it towards himfelf, and makes the cylinder turn backward.

By loofening the fcrew C *q*, (Fig. 50,) which is at B in Fig. 1, the bin, before preffed againft this fcrew by the fpring or plate A *s k*, (Fig. 50,) is moved farther from the cylinder, the fpace between the cylinder and the end of the valves is increafed, and a greater quantity of corn then paffes at a time. By turning the fcrew C *q* farther in, the bin is pufhed nearer to the cylinder, and fewer feeds are dropped.

To know exactly how much the bin fhould, at any time, be fet nearer to, or farther from the cylinder, there is, at one of the fides of the bin, a fmall fcrew, of which the head *m* paffes through a circular opening M N, (Fig. 51,) in the largeft plate of the box, where it becomes a certain guide, by means of a few equal divifions engraved and numbered at the edge of that opening. The centre of the arch of this opening is the fame as that of the hole *n*, upon which the bin moves.

Of the Hopper, Plate XIII.

Fig. 67. reprefents in perfpective the hopper which is feen at A in Fig. 1, and of which the bottom covers the top of the feed-box. D, (Fig. 76,) is the front, and A the right hand end of the hopper. The boards which form the ends A and B are three quarters of an inch thick; thofe of the fides D and C are feven twelfths of an inch thick; and the thicknefs of the cover is five twelfths of an inch. The fides and ends, which are at right angles to each other, and to the bottom, are joined together by dove-tail tenons; and the bottom is joined to the ends A and B by tenons which go into mortifes in thefe ends, as may be feen on the line *b g*. The four tenons G, H, E, F, enter into the mortifes Q, R, S, T, in Fig. 24, of which the dimenfions have been given. Thofe dimenfions fix the length *g e*, or *k d*, of the hopper, (Fig. 76.)

Its breadth, from outfide to outfide, at *a k*, or *b g*, is feven inches; and its outfide depth *k g*, or *d e*, is eight inches and a half. The height of the legs of the hopper, from the line *b l*, where it refts upon the upper furface of the table, to the line *b g*, which is the under furface of its bottom, is determined by the diftance between the top of the feed-box and the top of the table: it is here eight inches and a fixth. In the middle of the breadth

breadth of the two legs, are two openings, N and P, rounded at their top, to let through them the iron axis which bears the cellular cylinder, and keeps the feed-box steady under the hopper. These two openings are seven inches high, and one inch and three quarters wide. The hopper is fastened to the table by two hooks, one of which is seen entire at L N M, and part of the other at P Q. Each of them moves upon its rivet L, just above the opening of the foot, and is bent from thence to N, to make room for the passage of the axis; after which it hooks into a ring M and Q, fixed upon the table, but not mentioned before.

Towards D is a square opening, an inch and a half wide, cut immediately above the bottom, and through which the hopper may be emptied. This opening is shut by a small plate of iron, or brass, which turns like a latch upon a screw *n*, which fastens it at that end, whilst the other end *r* is slipped down to the small piece of brass or iron *v x*, which is fastened to the box by a screw at *x*, in such manner, that the pricked part of the latch, near *r*, is covered by the end *v* of this last small piece, which is bent for that purpose, so as not to lie quite close to the box, and the edge *r q* of the farther part of the latch rests upon the edge *x* of this small piece.

Of the Fore-carriage, Plate XIV.

Fig. 77 is a perspective view of the fore-carriage without its wheels. It is seen with its wheels in Fig. 1. Plate X. Fig. 80 represents a geometrical plan of the inside of one of the wheels of the fore-carriage, which is seen at *t* Fig. 1, Plate X. and Fig. 81, Plate XIV. represents a section of it. P and Q, (Fig. 77,) are the two fore-ends of the beams, to which the fore-carriage is fastened by hooks and rings.

In Fig. 77, *a d*, and D E, are the two exactly similar pieces which are seen at S *s* and V *r* in Fig. 1. Their length, *a d*, (Fig. 77,) is two feet eight inches; their breadth, *d* A, is two inches and two thirds, and their thickness is two inches. They are parallel to each other, and connected by two traverses, *g h*, *f l*, of which the ends are tenons pinned into mortises in the pieces D E, *a d*. These two traverses are omitted in Fig. 1, Plate X. in order to render that drawing the more simple. The length of these traverses, exclusive of their tenons, is two feet, their breadth is two inches and a quarter, and their thickness one inch. These two traverses are perpendicular to the two other pieces. Their distance from each other, between the farthest outside edge *g h* of the one, Fig. 77, and the farthest outside edge *f l* of the other, is seven inches and a half. The edge *g h* is one foot six inches and a third distant from the two ends B and D.

F G is an axle-tree, of which the middle part *n s* is two inches and seven twelfths square, and of which the upper angles are cut off as in the drawing. The square shoulders of the two ends *s n*, from whence the spindles proceed, project a very little beyond the outside of the pieces D E and *a d*, in order that the nave of the wheels may not rub against these pieces. The spindles *s* G, *n* F, are eigh inches and a third long, and one inch and five twelfths in diameter. This axle-tree is placed upon the pieces D E, *a d*, parallel to the traverses *g h*, *f l*, in such manner, that the distance from the line *s n* to the ends E and A, is a foot and a half. This axle-tree is fastened to the two pieces D E, *a d*, by two iron pins and nuts, *b q*, an inch and a sixth square, of which the screw, which is seven twelfths of an inch in diameter, has a head an inch and a half in diameter, which lies close to the under surface. This screw is represented with its nut in Fig. 78. Upon this axle-tree are fixed two wooden pins, five or six inches long, and five tenths of an inch, or a whole inch in diameter. These pins are perpendicular upon the upper surface of the axle-tree; the space between them is four inches, and this space is in the middle of the length of the axle-tree. This axle-tree is pierced perpendicularly between the two pins, to admit another pin, which will soon be spoken of.

The two wheels, which are placed at F and G, are exactly alike. Fig. 80 represents the inside of one of these wheels, with a pully fixed round its nave, and fastened to its spokes by four screws, each of which goes through the pully and one of the spokes. This pully is seen in profile at *b d*, (Fig. 81,) with two of its screws.

The total diameter, *g b*, of each wheel, exclusive of its iron hoop, is two feet and a half; that of the nave *p q* is four inches and one sixth; that of the pully *b d* is one foot two inches and a sixth; the thickness of the pully is an inch and one third; its grove, which is cut down square, is two thirds of an inch wide, and two thirds or three quarters of an inch deep. The length *p r*, or *q s* of the nave, is six inches; the thickness of the wheel at *i n* is an inch and two thirds, and at *i b* two inches and a quarter. Of the four hooks R, H, T, K, (Fig. 77,) which serve, by means of two rings, to fasten the fore-carriage to the ends of the beams P Q, the two, H and K, are fastened in the usual way, by nailing them, at their flat end, upon the two pieces of the fore-carriage: but the other two, R and T, are shaped like a carpenter's square, of which one end is screwed upon the beam, in order to facilitate the putting on or taking off of the ring. At T, this hook is placed in its proper situation for holding the ring: at R, it is turned the other way, that the ring may be taken off easily.

Of the Pieces which support the Drill upon its Fore-carriage, Plate XIV.

Fig. 82 represents in perspective a piece of wood which supports the drill upon its fore-carriage, when there is occasion to turn it in sowing. This piece may be called the pole. It is seen at *x d* in Fig. 1, Plate X. Its end A, (Fig. 82,) enters into the two bridles or belts *g r h* and *a c b*, (Fig. 26,) which have been spoken of before, and of which one is seen near *d* in Fig. 1. Its other end *q n*, (Fig. 82,) rests upon the axle-tree (Fig. 77,) between the two pins, as is expressed by pricked lines in Fig. 82, and as may be seen at *x* in Fig. 1.

The breadth *q r*, (Fig. 82,) of the lower surface of this piece is an inch and a quarter, throughout its whole length, to its end A; and its thickness throughout its whole length *q s* is an inch and a half. Its upper angles are taken off, from the end *q r* to *s*; but from *s* to A, this piece is shaped like the two bridles or belts into which it is to enter.

Its length from *q* to *s* is one foot seven inches and five-sixths; and from *s* to *t*, it is two inches and seven-twelfths. At *t*, the thickness of a quarter of an inch is taken off from its under surface, as at *t v*; and from *v* to A, its length is five inches and five-twelfths. It is the length *s* A, that goes into the two belts or bridles *g r h*, and *a c b*, (Fig. 26, Plate XI.) and the notch or shoulder *t* is made in order to insert a wedge whenever it is necessary to make the end *q r*, (Fig. 82,) rest upon the middle of the axle-tree, in order to convey the drill the more easily to any distant part, without putting it upon its hind-carriage. This wedge saves the seedsman the trouble of holding up the handles of the drill so high as he would otherwise be obliged to do, to make the end *q r* of this piece (Fig. 82,) rest upon the axle-tree. It is by the help of this piece, that the seedsman, when he comes to the end of each bout of the drill, is enabled very easily to turn it in order to begin another, by lifting the drill up by its handles; for as the end of this piece rests upon the middle of the axle-tree, he makes the drill follow the fore-carriage which is drawn by a horse; and as the distance, in this case, is but five or six feet, there is no occasion for his making use of the wedge. By this means the drill is turned conveniently, and without any loss of time.

The line A *v*, *t s*, are even; but *q s* is inclined at *t s*, and makes with it an angle *t s q* of 166 degrees. *s a* and *g n* are two square pins, fastened by tenons into the middle of the breadth of the under surface *r q s*, perpendicularly to the lower surface *t s*. The pin *s a* is placed near the bending *s*, and the distance between the edges or lines *s a* and *g n*, is fourteen inches and two thirds. The breadth *a o* and *n p* of these pins, is an inch and a quarter; their thickness is two thirds of an inch; the length of *s a* is three inches and a half, and that of *g n* five inches. This pin *g n* is rested against the axle-tree

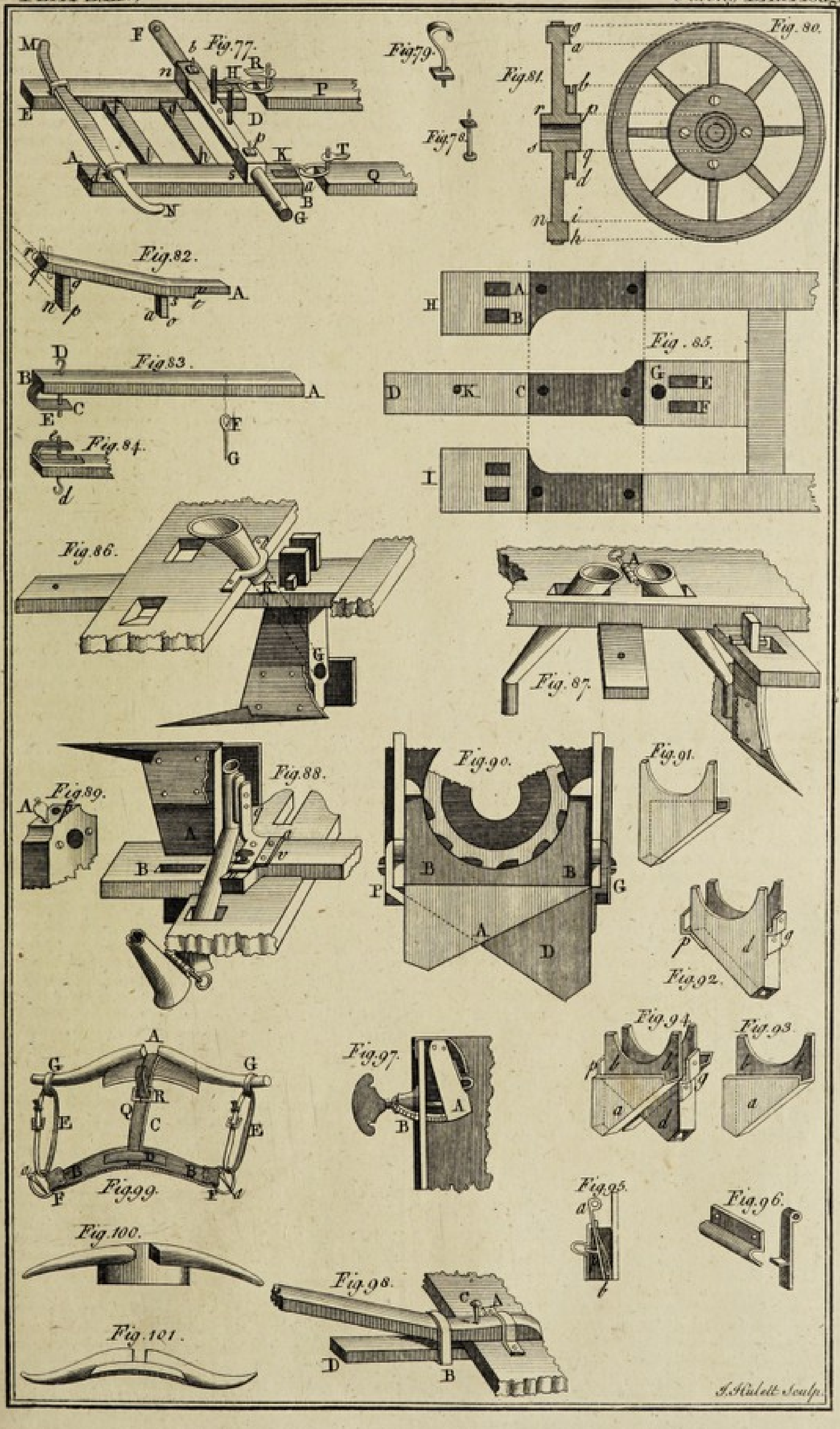


Fig. 77.
Fig. 78.
Fig. 79.
Fig. 80.
Fig. 81.
Fig. 82.
Fig. 83.
Fig. 84.
Fig. 85.
Fig. 86.
Fig. 87.
Fig. 88.
Fig. 89.
Fig. 90.
Fig. 91.
Fig. 92.
Fig. 93.
Fig. 94.
Fig. 95.
Fig. 96.
Fig. 97.
Fig. 98.
Fig. 99.
Fig. 100.
Fig. 101.
J. Hulett Sculp.

F G of Fig. 77, and the other, *s a*, (Fig. 82,) is placed near the table of the drill. The ufe of thefe two pins is only to hinder this piece of wood from flipping out of the two belts before defcribed.

Fig. 83 reprefents in perfpective the piece of wood which fupports the drill upon its fore-carriage, when it is placed upon its hind-carriage, in order to be removed from one place to another. This piece neither is, nor can be, feen in Fig. 1, which reprefents the drill in the ftate of actual fowing, and without its hind-carriage. The end A, (Fig. 83,) goes into the belts *e f*, *g h*, (Fig. 21,) before defcribed, like which it is fhaped; and the end B, (Fig. 83,) refts upon the axle-tree, (Fig. 77,) between the two pins. This part of the axle-tree is covered before and beneath by a flip or hook of iron, B E C, (Fig. 83,) which is nailed under the end of the piece A B, as in Fig. 84. The axle-tree, the bar, and its hook, are traverfed by an iron pin, D E, (Fig. 83,) and *d e*, (Fig. 84,) which paffes through the hole in the axle-tree, between the two pins, (Fig. 77.) The length of this piece, A B, (Fig. 83,) is three feet and four inches; its breadth is two inches and a half, and its thicknefs is one inch and a third. The pin F G, which is fufpended here, is put into the ring or bridle L, (Fig. 22,) and goes through the hole immediately underneath it.

Of the Hind-Carriage.

This hind-carriage is fo fimple that it would be needlefs to give a drawing of it. It confifts only of two common wheels, unfhod with iron, two feet eight or nine inches in diameter, fet upon a very fimple axle-tree, in the upper furface of which are two holes, into which are put the two pins before-mentioned, which are under the beams of the drill. One of them is feen at *f h*, (Fig. 3,) and likewife at △, (Fig. 1,) Plate X.

It is neceffary to fix, by proper marks, the refpective places of the feveral fcrews and mortifes of the whole machine, in order that when it is taken to pieces and put together again, none of thefe pieces may be mifplaced, or any of the helixes (or fpiral lines) which the flat-headed fcrews have formed in the wood, be fpoiled.

It is better to make the teeth of the harrow bend a little more than thofe before defcribed, and reprefented in Fig. 5, Plate X. They fhould bend fo that the point *e* of the tooth may project about four inches beyond the pricked line *f*.

Figures 85 *and* 86, *Plate* XIV. *compared with Figures* 2 *and* 31, *Plate* X. *and* XII.

The mortife A in Fig. 85, is the fame as that which is marked Q in Fig. 2. But the end of each beam fhould be made about two inches wider on the infide, and a fecond mortife B, (Fig. 85,) fhould be cut through it, fimilar and parallel to the former, and at the diftance of five-fixths of an inch, or an inch, from it, that the fhare may be faftened in the one or the other, according as it may be found proper to place the two fore-fhares nearer to, or farther from each other, in order to fow the rows clofer than they would be by the fituation of the mortifes Q and R, (Fig. 2:) but then the pipes which anfwer to the back of thefe two fhares fhould be faftened in the manner which will be explained hereafter.

The middle piece K L, (Fig. 2,) fhould project beyond the table, from C to D, (Fig. 85,) about nine inches or a foot, and the belt or bridle L, (Fig. 2,) fhould be fuppreffed. This fame piece fhould have, in its part E F, (Fig. 85,) nearly the fame breadth as the end of the beams H, I; and two mortifes, E F, inftead of one, in which the fhare, thicker than was faid before in its upper part, is to be faftened by two tenons and a key. The pipe which terminates behind this fhare, inftead of paffing fideways, as in Fig. 31, will go ftraiter and more eafily through the hole G, (Fig. 85,) which is feen at K, (Fig. 86,) and from thence through the thicknefs of the fhare, which will be pierced for this purpofe from K to G. The fole of this fhare, from this hole to its bottom, will be of the fame thicknefs as was mentioned before.

Figures 87 *and* 88, *Plate* XIV. *compared with Figures* 29 *and* 30, *Plate* XI.

The upper openings, *f d*, *h o*, (Fig. 29,) of the two foremoft pipes fhould be joined by a good hinge A, (Fig. 87,) well foldered to them, and of which the pin, ending with a ring at one end, may eafily be taken out. By means of this hinge, thefe two pipes may be fet clofer together, or farther afunder, like the legs of a compafs, and be fitted to the different fituations of their fhares. The faftening of the lower end of thefe pipes will be nearly the fame as was defcribed in Fig. 30; with this difference, that inftead of bending the fquare *k i g* of that figure only at *i*, upon its upper furface, and making its part *k i* run lengthways of the beam E F; here, (Fig. 88,) is twifted as it were in its bending, in order that the part *s n* may lie acrofs the beam, and lengthways of the table. In this cafe, if the fhare A be put into the mortife B, the part *s n* muft be flipped farther, till the hole *s* can be faftened at *n*, by the thumb-fcrew which is at *n*: and as this part, being held only by a fingle fcrew, might be apt to loofen and jog, a piece or flip of iron, *a v*, is permanently fixed at its edge, fo as to keep it tight in either of its fituations. The fcrew *n* faftens in a nut funk into the upper furface of the beam, where this nut is permanently fixed, and covered by the table. There fhould likewife be two holes in the other part of the fquare, towards *q*, to ferve for the two different fituations of the fhare. The pipes of the fhares are more eafily made round, as here reprefented, than fquare, as was directed before.

Figure 89, *Plate* XIV. *compared with Figure* 35, *Plate* XI.

Inftead of the fmall groove *n*, (Fig. 35,) in the brafs cylinder, intended for introducing a little oil to that part; a more fimple way will be to bore a perpendicular hole *p*, (Fig. 89,) through the head of the ftandard, down to the fpindle; and this hole may be covered by a fmall plate A, made to turn upon a fcrew or rivet.

Figures 90, 91, 92, 93, *and* 94, *Plate* XIV. *compared with Figures* 50 *and* 53, *Plate* XIII.

As the three pipes or funnels G, H, M, (Fig. 53,) embrace at their upper opening, only a fmall part, *f*, *t*, (Fig. 30,) of the cellular cylinder, fome grains may chance to be loft on the fide where this cylinder is not covered, from *d* to *f*. To prevent this inconvenience, they may be made fo as to embrace the whole lower femidiameter *d f t* of the cylinder in the manner reprefented in Fig. 90, 91, 92, 93, 94.

The firft funnel, which is feen geometrically at A, B B, (Fig. 90,) is reprefented in perfpective, and of a fmall fize, in Fig. 93, where its correfponding parts are marked with the fame letters *a*, *b b*. This is the funnel M of Fig. 53. The fecond large funnel, of which a part appears at D, (Fig. 90,) is feen entire and in perfpective, in Fig. 92, where the fame part is marked *d*. This is the funnel H of Fig. 53. Two fcutcheons *g* and *p* are foldered to this funnel, and faften it, by fcrews, to the fore and hind inner furfaces of the box, as at P G, (Fig. 90.) The third funnel, which does not appear in Fig. 90, and which is like the firft, is reprefented in Fig. 91. This is the funnel G of Fig. 53. Thefe three funnels are made feparately, of very thin plates of brafs, bent, and well foldered; and are afterwards firmly rivetted to each other, fide to fide, as in the perfpective, (Fig. 94.) They are fo tightly joined, that the fcutcheons *g p*, (Fig. 92 and 93,) are alone fufficient to hold them all in their proper places.

Figures 95 *and* 96, *Plate* XIV. *compared with Figure* 66, *Plate* XIII.

In the reprefentation of this part in Fig. 66, the valve *e f* is actually clofed by its fpring *a b*, to the cover *d c*, and in this fituation it is fhut: but when the corn preffes againft this valve, and forces it into the fituation *a b*, (Fig. 95,) a grain may jump fo as to get between the valve and the cover, and thereby hinder the valve from clofing again; fo that more corn would continue to run out. To guard againft this accident, each valve muft have a small tongue *p* immediately below the cover, and the cover must be bent in that place, to receive the tongue when the valves closes. Both of these are represented separately in perspective, in Fig. 96.

Figure 97, *Plate* XIV. *compared with Figures* 50 *and* 51, *Plate* XIII.

Instead of the index *m*, (Fig. 50,) and the graduated opening M N, (Fig. 51,) an easier and more simple way will be, to fasten the end A of a graduated limb or border of a circle, A B, (Fig. 97,) to the bin, in such manner that its other end B may project through a hole in the front of the brass-box. This will mark exactly the situation of the bin.

Figure 98 *compared with Figures* 82, 85, *Plate* XIV. 21, 26, *Plate* XI.

When the middle piece is lengthened, as at C D, (Fig. 85,) there is no occasion for the ring or bridle L, (Fig. 2,) and *f k*, (Fig. 26,) or for the pieces *s a* and *g n*, (Fig. 82;) and then the pole A, of this Fig. 82, will pass through the belt A, (Fig. 98,) and through another belt B, which last goes round it and the piece D. This belt is fixed by two screws under the piece B D. The pin C, which penetrates into the table, will complete the fixing of this pole. The hole K, (Fig. 85, receives the pin F G, (Fig. 83,) which goes through the two pieces C D, (Fig. 85,) and A B, (Fig. 83.)

M. de Chateauvieux's *Instructions concerning the Manner of using* his Drill-Plough.

" This drill is represented in Fig. 1, Plate X. with all its parts put together, in a state fit for working. When the thongs which encompass the grooves of the pullies Q P of the axis in Fig. 1, and those of the fore-carriage *u t*, are stretched properly, and the hopper is filled with corn, a horse is to be harnessed to the spring-tree bar, and an intelligent man, who can walk a good pace, should guide this horse, which should be a mild, tractable creature.

" The seedsman will hold the handles of the drill, in order to direct it: and he will warn the guide whenever he deviates from the strait line in which he ought carefully to keep. He will also observe, from time to time, whether the distribution of the seed is not stopped by some unexpected accident: for he can see the end of the pipes through which the grain should drop; besides which, the corn makes a little noise in passing through the pipes, and he may easily hear it. The seedsman will take particular care that the thongs do not slip out of the grooves of the pullies; and if they do, he will replace them instantly: but this accident is very rare; nor, indeed, does it hardly ever happen, unless the thongs are new, and have not yet been sufficiently stretched. It is proper to observe here, that we have tried hempen ropes, and small iron chains: but thongs of leather are much better than any other thing.

" Care should be taken, that the seed-corn be free from grit, dirt, or little stones; for either of these might damage the valves of the bin. If the corn has been steeped in lime-water, as is the practice of some farmers, in hopes of preserving their crops from smut, it must not be sown till it is so dry that the grains will slip easily over one another.

" The seedsman will be particularly careful to replenish the hopper before it is quite empty.

" He will oil the spindles of the axis once or twice a day; observing that they require most frequent oiling when the drill works in dry ground, which sends up a very fine dust: and he must cleanse the spindles and the pipes in which they turn, every morning, by rubbing off the old oil, and putting on new. He will also, from time to time, cleanse the spindles of the axle-tree of the fore-carriage, and rub them with soap. If any rain happens to fall during the time of sowing, he must wipe the drill very dry, as soon as he has got it home, and particularly about the axis, to prevent its rusting. It is even highly proper to have a leather covering to put over the table and all the parts upon it, and likewise over the standards, the axis, and the hopper. It is easy to conceive the proper cut of this covering.

" The prudent husbandman should always have with his drill, a small box, containing a hammer, a pair of pincers, a turn-screw, thongs, ropes, nails, iron-rings and buckles, a little bottle of oil, and other such like things, in order that, if any of them should be wanted in the field, he may not lose time by being obliged to send home for them.

" The seedsman will observe, when he is going to sow, not to leave the wedge *t*, (Fig. 24, Plate XI.) under the pole, in order that end *c*, (Fig. 1, Plate X.) may not press upon the axle-tree of the fore-carriage. (The only use of the pole, at the time of sowing, is to turn the drill when a second bed is to be sown after the first is finished, and so of others.) It is easy to conceive, that if this end of the pole should make the drill rest upon the axle-tree, it might often happen, that, by its being thereby too much subjected to the motions of the fore-carriage, the stones or clods which the wheels may meet with, would, by raising them higher than the general surface, throw the shares out of the ground, or at least occasion the furrows to be shallower in those places; things which ought by all means to be avoided.

" We have represented but one spring-tree bar, in Fig. 1, because we think a single horse may be used, without any inconvenience, when the ground is not too much loaded with wet: but if the land be too full of water, two horses must be put to the drill, which, in that case, must have a double bar, the manner of ordering which is too well known to need any description. Each horse will then go in a furrow, and they will not poach the bed, as would be the case, in wet land, if the drill was drawn by only one horse, whose steps are determined by the middle of the bed.

" For want of horses, oxen may be used, and the sowing may be performed equally well.

" It is proper to observe, that the quantity of seed distributed by the drill is exactly the same, whether the horses or oxen go fast or slow. If, for example, one bed is sown in ten minutes, and twelve or fifteen minutes are employed to sow another, of equal dimensions, neither more or less seed will be dropped in one, than in the other; because the revolutions of the cylinder, (Fig. 39,) are invariably regulated by those of the wheels of the fore-carriage, whose circumference, be it turned quick or slow, will always describe a line of equal length, and the cylinder turns exactly with these wheels. The only difference that can arise from the greater or less speed of the horse, is the gain or loss of time: but the quantity of seed sown will be constantly the same, so long as the drill remains set in the same manner.

" The greater or less goodness of the soil, its having been well or ill prepared for sowing, its state of dryness or humidity, and several other circumstances which should be carefully attended to, will oblige the husbandman sometimes to vary the quantity of seed. The drill is accordingly made to distribute more or less, by the means before-mentioned, of placing the bin nearer to, or farther from the cellular cylinder, by turning the screw L, (Fig. 50, Plate XIII.) By setting the bin farther off, a greater quantity of seed is dropped; and by bringing it nearer, a less proportion is sown. It will be easy to find the proper distance at which to fix it, in order to its giving out exactly the desired quantity of seed.

" Though this method affords a pretty wide latitude, it may sometimes not be sufficient. This is a case which will very seldom happen, and which we have not yet met with; but if it should at any time take place, the drill may easily be made to distribute still more or less seed, by changing the pullies of the axis, Fig. 39, Plate XII. for others of a larger or smaller diameter, which will either accelerate or retard the motion of the axis, in proportion to their size.

" We will suppose, for example, that the pullies are but of half the diameter of those before described. It is evident that these smaller pullies will make the axis turn round twice, where it turned but once with the former, and that double the quantity of seed will consequently be dropped

dropped on the same length of ground. By the same rule, pullies twice as large will turn the axis but half the number of times, and but half the quantity of feed will of course be let fall, in the same space. The proportion of the feed sown may likewise be increased or diminished, by a greater or less number of cavities in the cellular cylinder; and the changing of this cylinder is soon and easily performed: but, as was said before, there will very seldom be any occasion for these alterations.

"The furrows opened by the shares of the drill, and in which the seeds are deposited, should be of different depths, in different cases; and this may be effected by means of the rings which fasten the drill to its fore-carriage at the hooks R H, T K, (Fig. 77, Plate XIV.) For general use, the diameter of about three inches, from inside to inside, will be sufficient for these rings, and then the furrows are made about three or four inches deep. They will be opened deeper by using rings about four inches in diameter; and it is immaterial whether they are round or oval. With smaller rings, the furrows will be made shallower; and their depth may also be diminished, by making the horse draw with longer traces, or by using a lower horse.

"If very shallow furrows are wanted, or only just the surface of the ground is intended to be opened, the wedge *t*, (Fig. 24,) must be put under the pole. In short, a little practice will soon shew the husbandman how to manage this drill in every respect, and make him thoroughly acquainted with all that is necessary to be known in regard to the distribution and proper covering of the feed, which last part is perfectly well performed by the teeth of the annexed harrow.

"If any thing should still seem obscure to those who have read attentively, and studied the description of each part of this drill, let them but set actually to work, and their ideas of it will soon be perfectly clear. Each part, taken separately, may be made with great ease: their sizes, shapes, and proportions, are pointed out in such manner, that no workman of common understanding can mistake; and when the parts are constructed, there can be no difficulty in putting them together, if the foregoing directions are but observed."

"*Description of a Harness, to yoke Oxen one before another,*" *Plate* XIV.

"The utility of being able to put oxen to this drill, in such manner as to make them go one before another in the furrow, without treading upon the places which are to receive the feed, first put me upon contriving a harness proper for these cattle: for I was not satisfied with those I had seen in different countries. Two of my teams of oxen, harnessed in my new manner, have worked the whole year; several persons have adopted the method; and I am more and more pleased with it. This harness is very simple, and very light, and does not subject the oxen to any irksome confinement.

"Fig. 99 and 100, represent the whole of this harness, that is to say, its plan and a view of it. Fig. 99 shews it to be composed of a yoke A, which the ox bears upon his head, and which is there fastened to his horns by long thongs. The rest of the harness is of leather. The piece B, is the principal part, and that by which the ox is to draw. It rests against his neck, a little below the withers, and sits extremely close to the neck when the ox draws. If it be made of double leather, there is no occasion for the piece of leather D, which serves only to strengthen it when it is single. The thong C fastens in the buckle Q R, which is fixed to the yoke by another thong. The use of these is to hinder the large piece of leather B, from rising above the withers, when the ox tosses his head, or raises his neck. Care should be taken not to stretch the thong C too much, for the ox must not draw by it.

"The thong E E, with their buckles to lengthen or shorten them, serve to make the oxen draw by the yoke, by putting them through the large iron buckles F F, and the leather buckles G G, which must be nailed to the yoke. The length of these thongs is suited to the purpose for which they are intended.

"My traces are made of ropes, and I find them convenient. At one end of them is part of a leathern trace, about fifteen inches long, like the end of the harness of a coach horse. This end is put through the large buckles F F, where it is fastened by the tongue *a a*: so that the trace may easily be shortened or lengthened."

DRILL-RAKE, an instrument invented by M. Vanduffel, for drilling pease, &c.

This instrument, which is chiefly calculated for light grounds, in small inclosures, not exceeding four or five acres. It is a sort of strong plough rake, with four large teeth at *a a*, *b b*, (Plate XV. Fig. 1,) a little incurvated, as represented in the figure. The distance from *a* to *a*, and *b* to *b*, is nine inches. The space, or interval, beteen the two inner teeth, *a* and *b*, is three feet six inches, which is sufficient room for the cultivator or hoe-plough to move in, if conducted with care, before the pease have branched much. To the piece of timber *c c*, forming the head of the rake, are fixed the handles *d*, and the beam *e*, to which the horse is fastened.

It is evident, that when this instrument is drawn over a piece of land made thoroughly fine, and the man who holds it bears upon the handles more or less, according to his discretion, four channels or small furrows, *f*, *g*, *h*, *i*, will be formed; that the distance between the furrows *h i*, and *f g*, will be nine inches: and that the interval *e*, or space contained between the furrows *g*, *h*, will be three feet and a half. It is also evident, that these distances may be preserved with great truth, provided the teeth *a*, *a*, return (when the ploughman comes back, after having ploughed one turn, or about, as they call it) in two of the channels formed before, marked *h*, *h*; so that though he cuts four drills at the first bout, yet, in effect, he only forms two drills each turn, because there are always two drills to be passed over twice, or reploughed, being, in fact, not much more than guids, or marks of direction. Yet even this small work of supererogation repays itself, because it makes the drills more open, distinct and clear.

If the first four channels, formed at one motion by this instrument, are streight and true, all the lines in the field will partake of the same regularity. It will therefore be proper to mark out this first trace of the drill-rake by exact measurement, fixing into the ground, at every distance of ten feet, little flat sticks, labelled with paper; which being finished, the rest may be left to the ploughman.

When the ground-plot of an acre is thus formed into drills (which may be completed in four hours, by one ploughman, a horse, and a boy to lead the horse) you must send two or three women and children into the field, in order to sprain the pease, or scatter them by a single motion of the hand, at a certain distance one from another, into the channels. Use no harrow, which will be apt to draw the seeds out of the lines; but cover them with the flat part of the head of a hand-rake, and press them down gently.

The great excellence of this drill-rake consists in its simplicity; for after the measurement of the parts is once laid down, the meanest carpenter and smith in England can either make or repair it; and if the first four lines formed by it are true, the rest of the lines or rows must be geometrically exact, which is an elegance none can feel, but such as take delight in correct husbandry. *Essays in Husbandry, Essay II. page* 212.

DRONE, the male bee, one that makes no honey. *See the article* BEES.

DROPSY, a disease incident to horses, and generally called the water-farcy. *See* WATER-FARCY.

DROPWORT, the name of a perennial weed common in pasture lands, having winged leaves; the divisions of which are all regular, and sharply indented about the edges. The flowers are white, growing in a bunch like an umbel. Its roots are very remarkable, consisting of a bunch of knobs hanging upon threads; from whence it has the name of filipendula, and dropwort. The flowers have an agreeable smell.

DROUGHT, dry weather, want of rain. It also signifies thirst, or want of drink.

DUB, a pool, or pond of water.

DUCK, the name of a well-known fowl, very necessary for the husbandman's yard, as they require no charge in in keeping; for they live on loſt corn, ſnails, &c. for which reaſon they are very proper for gardens. Once in the year they lay a large quantity of eggs, eſpecially a ſort of duck which turns up its bill more than the common kind. When they ſit they require no attendance except they having a little barley or offal corn near them, that they may not ſtraggle far from their neſts to chill their eggs. They are reckoned to be better hatched under a hen than a duck; becauſe while they are young the hen will not lead them ſo often into the water. Some reckon it very proper to cut off the feathers from their rumps; becauſe when their tails are wet, it often occaſions their drowning. As to the fattening of them, you may do it in three weeks's time, by giving them any kind of corn or grain, and plenty of water. Ground malt, wet either with milk or water, is beſt. *Mortimer's Huſbandry, vol. I. page* 257.

DUN, a colour partaking of brown and black.

DUNG, the excrements of animals, putrified vegetables, &c. uſed in improving land.

Dungs are intended either to repair the decay of exhauſted worn-out lands, or to cure the defects of other ſoils, which are as various in their qualities, as the dungs uſed to meliorate or reſtore them. Some lands are too cold, moiſt, and heavy; whilſt others are too light and dry. To anſwer this, ſome dungs are hot and light, as that of horſes, ſheep, pigeons, &c. Others again are fat and cooling, as that of oxen, cows, hogs, &c. And as the remedies which are uſed muſt be contrary to the diſtempers they are to cure, ſo the dung of oxen, cows, and hogs, ſhould be applied to lean, dry, light earths, to make them fatter and cloſer; and hot and dry dungs to cold, moiſt, and heavy lands.

Dung has two peculiar properties. The one is to fatten the earth, and render it more fruitful; and the other, to produce a certain ſenſible heat, capable of cauſing ſome conſiderable effect; which laſt is ſeldom found but in the dung of horſes and mules, while it is newly made, and a little moiſt.

Horſe-dung, the leaſt fat of any, is the moſt fiery, if taken freſh as it falls, and the moſt apt to excite a ſudden fermentation; for which reaſon it is then fit only for the hot-bed. When this heat is paſt, it may be ſpread on fields where we would have a rank graſs to ſpring: but it ſhould not by any means be admitted into the garden, or where we would wiſh to have good roots, unleſs the ground be very ſtiff, cold, or wet, and then too it ſhould be well rotted, leſt, inſtead of correcting the ſoil, it leave couch, and other pernicious weeds, worſe than the diſeaſe itſelf; the ſeeds of hay, and of other plants, which the horſes eat, coming oftentimes entire from them: for thoſe vegetables which cattle chiefly eat commonly ſpring up from their dung; as long knot graſs from this beaſt; ſhort, clean, and ſweet paſture from ſheep and cows; the ſow-thiſtle from ſwine. Ground mucked with horſe-dung is always the moſt infected of any; and if it be not perfectly conſumed, it makes your roots grow forked, fills them with worms, and gives them an unpleaſing reliſh: but if laid on at the beginning of winter, and turned in at ſpring, it ſucceeds ſometimes with pulſe.

Horſe-dung is greatly improved by being mixed with its oppoſite, cow-dung, which is cold and fat; and this mixture is conſiderably meliorated if mixed with a proper earth, with mud, or with aſhes and urine. Cow-dung alone is the worſt of all dungs to endure wet, becauſe it is the moſt eaſily diſſolved. But either of theſe dungs, either ſingly, or mixed as above, ſhould not be uſed till it is old; nor ſhould it be laid abroad expoſed to the ſun and wind, as is the practice of ſeveral injudicious farmers, who let it lie ſpread on their field-lands during three or four of the ſummer months, till the ſun and air have exhauſted all its virtue: whereas, if it be laid in heaps, mixed with earth, and left in that ſtate till it be rotten, it will be the ſooner brought to a proper temper, will produce a ſweeter graſs when laid on paſture grounds, and will go much farther than in the common way when ſpread before the plough for corn, of which it will then greatly promote the growth.

Mr. Miller ſays he has frequently ſeen new horſe-dung buried as it came from the ſtable, in very cold, moiſt land, and always obſerved that the crops have ſucceeded better, than where the ground was dreſſed with very rotten dung.

Sheeps-dung and deers-dung are nearly of the ſame quality, and are generally eſteemed the beſt of all dungs for cold clays. Some recommend beating them into powder, and ſpreading them very thin over autumn or ſpring crops, about four or five buſhels to an acre, in the ſame manner as aſhes, malt-duſt, &c. are ſtrewed. But this light dreſſing does not laſt long. The moſt common way of conveying it upon land is, by folding of the ſheep themſelves upon it, by which means their urine is ſaved as well as their dung, which ought to be turned in with the plough as ſoon as poſſible, that it may not lie expoſed to the heat of the ſun. In Northamptonſhire, they think it beſt to fold ſheep after July, and to fold them the lateſt upon dry land. In ſome parts of France, where they likewiſe fold their cows and oxen, the place of folding is changed twice every night. In Flanders, they houſe their ſheep at night in places ſpread with clean ſand, about five or ſix inches thick, which, being laid on freſh every night, is cleared out once a week. This mixture of ſand and dung makes an excellent dreſſing for ſtrong land; for the dung and urine of the ſheep is a very rich manure. M. Quintinie thinks it the greateſt promoter of fruitfulneſs in all ſorts of ground. This method of folding ſheep in a covered fold, and of mixing their dung with earth, ſand, &c. according to the nature of the ſoil it is intended for, is likewiſe, very properly, recommended by Mr. Mortimer; who adds, that he has known vaſt crops of rye upon barren lands that have been old warrens, well dunged by rabbits; and large oak and aſh upon the ſame, though the ſoil was very ſhallow.

Next to ſheeps-dung, the preference is generally given to that of ſwine, one load of which will go as far as two loads of other dung. The laying it on too thick may perhaps have occaſioned the old miſtaken notion of its breeding more weeds than any other dung: for all dungs will make weeds ſhoot up; whether they contain within themſelves ſeeds of thoſe plants, not ſo thoroughly digeſted by the animal as to be deprived of their vegetative power, as may ſometimes be the caſe, or by the additional fertility which they communicate to the earth. This dung is beſt when carried from the ſtye directly to the field, where it is a rich manure both for corn and graſs, eſpecially the latter, and for almoſt any ſort of land. Hot ſands and gravel are particularly benefited by it; and it is reckoned a very great fertilizer of fruit-trees. Many good huſbandmen prefer this dung before moſt ordinary ſorts of manure, and to take great care not only to have their hog-yards well paled and paved with pebbles, or other ſtones, or with chalk, which is much the beſt; but alſo to increaſe the quantity of the dung as much as they can, by throwing into the ſtye all the ſtraw, fruit, beans, roots, plants, weeds, &c. which are the refuſe of the garden, with the offals of the kitchen, and every kind of traſh; all which is not only very good for the hogs themſelves, but increaſes their dung to ſuch a degree, that ten or twelve ſwine have yielded ſixty or eighty loads of excellent manure in a year. Some notable farmers will make their hog-yards produce them an annual profit of twenty or thirty pounds. Mr. Worlidge thinks this the beſt of dungs to prevent or cure the canker in trees; and Mr. Mortimer eſteems it beſt for manure, when mixed with horſe-dung; for which reaſon he adviſes placing the hog-ſtye as near the horſe-dunghill as can conveniently be. The farmers in Staffordſhire frequently ſow on poor light ſhallow land, a ſmall white pea, which they never reap, but turn in as many hogs as they think the crop will fatten, and let them lie upon it day and night. The dung and urine of theſe animals enriches the land ſo much, that it ſoon acquires a thick ſward, and continues to be good grazing ground for ſeveral years.

In this light, of reaping a double advantage from the manuring of land, the author of the New Syſtem of Agriculture adviſes huſbandmen to ſow ten or fifteen

acres

acres of their ground with turnip-feed, a little before they fow clover, which, he thinks, is beft done in September: then, towards the beginning of March, to take the beft opportunity to buy three hundred fows, all fuch as will farrow in about a month. Let little ftics, formed of boughs or reeds, be made for them in the moft convenient parts of the clover ground, either in the corners, or under the hedges of thefe fields; and let the fows be kept up, and fed daily with the turnips which were fowed the autumn before. At firft, it will be neceffary to take the trouble of boiling them, tops and all, and of giving them in the troughs with the water not yet cold: they may afterwards be only fcalded; and in a week or ten days the fwine will eat them raw, with the greateft greedinefs and pleafure. In the beginning, or towards the middle of April, thefe fows will farrow; after which they muft not be fed with turnips any longer than till the clover is pretty high, when they and their pigs may be turned in among it. It is impoffible for one who had not feen it, to imagine how eagerly the fwine will graze on clover, which increafes their milk to fuch a degree, that the pigs fhoot forward at a double rate; and, as they leave off fucking, they too take to feeding on the clover, by which they profper fo faft, that, by the end of October, every pig will fetch twenty or five and twenty fhillings, in any market. The treading of great cattle is apt to break the ftalk of clover grafs, and they fpoil, by trampling it down, a much greater quantity than they eat: but fwine are never hurtful this way; and if there be any fear of their rooting up the ground, that may be eafily prevented by a ring in their nofes; though our author fays, he never knew a hog break up an inch of clover. They graze upon it with more pleafure than they could root.

Human ordure is a very fat and hot manure, full of fertilizing falts, and therefore extremely proper for all cold four foils, efpecially if it be mixed with other dung, ftraw, or eath, to give it a fermentation, and render it convenient for carriage. Some do not like to ufe it on account of its bad fmell; and others imagine, that it gives a fetid tafte to plants; but in this they feem to carry their delicacy rather too far. It is ufed with great fuccefs in many parts of France, all over Flanders, and, I believe, not lefs profitably round about London. Mr. Bradley fays, it is kept in pits, made on purpofe, in foreign countries, till it be one, two, three, or four years old: that of four years old is accounted the beft; that of three years tolerable; but the others not fo fit for ufe; and that the perfons concerned in thefe pits pay great regard to the place from whence they have it, preferring that which comes from towns where the moft flefh is eaten, as the ftrongeft and richeft manure. It certainly fhould not be laid on too new, nor in too great quantities, becaufe it is of a very hot nature; but when that heat is tempered by age, putrefaction, and a due mixture with other foils, it becomes a rich and excellent manure. Perhaps it may owe great part of this richnefs to the urine with which it is mixed; for tho' human urine be deftructive to vegetables, whilft it is new, by reafon of its burning fal-ammoniacal fpirit, as Glauber terms it, yet, as in many other moift things, fubject to putrefaction, time will correct that defect, digeft the urine, take of its fiery quality, and fo alter its nature, as to render it an extraordinary fertilizer of every kind of foil. Columella certifies, that old urine is excellent for the roots of trees. Mr. Hartlib commends the Dutch for preferving the urine of cows as carefully as they do the dung, to enrich their lands, and inftances a woman he knew near Canterbury, who faved, in a pale, all the urine fhe could; and when the pale was full, fprinkled it on her meadow, the grafs of which looked yellow at firft, but afterwards grew furprifingly. Similar to this is what Mr. Bradley relates, as of his own knowledge. Human urine was thrown into a little pit conftantly every day, for three or four years. Two years after, fome earth was taken out of this pit, and mixed with twice as much other earth, to fill up a hollow place in a grafs walk. The turf which was laid upon this fpot grew fo largely and vigoroufly, befides being much greener than the reft, that, by the beft computation he could make, its grafs, in a month's time, was above four times as much in quantity as that of any other fpot of the fame fize, tho' the whole walk was laid on very rich ground. The author of the Englifh Improver is therefore very right in faying, that human urine is of great worth, and will fatten land more than is generally imagined by our farmers, whom he advifes to take all opportunities of preferving this, and every fort of urine for their ground, as carefully as is done in Holland.

The dung of all poultry is of a very hot nature, full of volatile falts, and therefore extremely proper for cold lands, being light of carriage, and a little of it going a great way. It is moft commonly ufed for diftant grounds, where it is fprinkled on wheat or barley, after they are come up, or upon the latter at the time of fowing. Mr. Mortimer thinks forty bufhels fufficient for an acre. It is ufed to moft advantage when dried and powdered, and is very efficacious in keeping froft out of the earth. Its effects are fudden, but they do not laft long. Hens dung is very rich, though not fo hot as pidgeons dung, nor is it fo eafy to fow, becaufe it hangs more together, neither can it be fo eafily collected. The opinion that goofe dung is rather hurtful than beneficial to corn or grafs, is an ancient error, as is proved by Mr. Worlidge, who fays, he was credibly informed, that a flock of geefe having made a track a-crofs a field of wheat during the winter, and nibbled the corn clear from the ground in their daily paffage in fuch a manner, that the wheat upon it proved the next year much finer than any other part of the field. He alfo mentions a field which had been given to the town of Sutton, in Northamptonfhire, for feeding geefe, whofe dung rendered it one of the richeft paftures he ever faw, infomuch, that all forts of cattle fed on it very greedily; nor could he hear from any of the inhabitants, that fo much as one beaft received the leaft injury from it. He adds, that his own horfes, kept in a piece of pafture on which geefe lay very much, eat the grafs bareft where the fowls had dunged moft, and that he never found it do them any hurt, except making them too fat.

Perhaps the reafon why the dung of geefe has been faid to occafion barrennefs, flowed from obfervations where it had been laid too thick; for being of a hot fiery nature, it will, if laid on in too large quantities, deftroy the grafs; but if fpread thin in the winter, it will prove a very rich and valuable manure, efpecially if mixed with cooling earth, and left for fome time to putrify.

DUNG-HILLS, heaps of dung collected in the yard, and other places, belonging to a farm.

They are made up of the dung of different animals, of different kinds of ftraw, and other vegetable fubftances; and they have frequently different animal fubftances in their compofitions.

Compoft, or compound dung-hills, are a collection of different matters, as earth, mixed with dung from an ordinary dung-hill, lime, and other manures.

Some perfones make dung hills of this kind, and are of opinion, that the dung and other manures with which they are compounded, are thereby made to enrich a greater quantity of land, than if not mixed with earth; and befides, do not produce the bad effects which fometimes are produced by dung, when taken directly from a dung-hill, and laid upon land.

It will not be amifs that we enquire into the advantages of this kind of dung-hills, which will be a means not only of recommending them, but alfo of pointing out the moft proper method of conftructing them.

The firft thing to be enquired into, is the advantage arifing from the mixing lime, marle, or other manures, with the earth and dung. Lime, as it is a diffolver of all vegetable and animal fubftances, when mixed with dung, will help to diffolve it; and as it communicates an abforbent power to earth, will enable the earth with which it is mixed to attract the vegetable food in greater plenty from the air. But in order to make it produce thefe effects, it is neceffary to mix it with dung and earth; for if the lime is laid in a kind of ftratum above the dung, and below the earth, it will abforb the water that falls upon the dung-hill, and thereby will prevent the dung from receiving a fufficient quantity of water to make it putrify; and will alfo occafion fuch a heat as to burn the dung, and render it ufelefs; and, befides, can have but little influence in diffolving the dung, and communicating to the earth its abforbent quality. If the lime is laid above the earth, and expofed to the air, it will be attended with the fame confequences: it will abforb the water; and though it will attract the vegetable food from the air, yet will be of no more ufe for this end, than if fpread upon as much land as the furface of the dung-hill extends to.

The fame thing may be faid of marle, if ufed inftead of lime; but if marle is ufed inftead of earth, it is probable that the compoft will become very rich, as the marle has a very ftrong abforbent quality, and would be greatly expofed to the influence of the air. A much fmaller quantity than is ufed in the ordinary way, it is probable, would be found fufficient, and its effects would be fooner difcovered. If this is tried, it will be neceffary to carry the dung to the marle-pit, and there form the dung-hill; for marel is fo heavy a body, that it would be too expenfive to carry it firft to the dung-hill, and then to the field.

The advantage of mixing dung with the earth is next to be confidered. This, it is pobable, is the principle advantage of the compound dung-hills, and that the advantages arifing from lime are but trifling. They are often made without lime, and their effects, it is faid, are equally good.

Dung, in the ordinary dung-hills, has its vegetable food fometimes wafhed away by rain, when it falls in large quantities. Now this is prevented by the earth in the compound dung-hill, which abforbs the water, and all the vegetable food which it carries from the dung.

In the ordinary dung-hills, the dung on the furface, it is generally fuppofed, lofes a part of its vegetable food, which is exhaled by the fun, or carried off by the wind. This is prevented, by covering the dung with earth in the compound dung-hill.

But it is probable, that the compound dung-hill receives its principal advantage from the earth being expofed to the influence of the air; and if this be true, the more abforbent that the earth is which is ufed, and the larger that the furface of the dung-hill is, in proportion to its bulk, and the quantity of dung contained, it will be the richer.

This directs us to the proper method of conftructing it, to make it long and narrow, with as many divifions in it as can be made conveniently; for thereby a larger furface is expofed in the fame quantity, and the more vegetable food acquired.

It is proper to obferve further, that earth fhould always be in the bottom of the dung-hill, to receive any of the juices of the dung which the rain may carry downward; that the dung fhould be immediately covered with earth, to prevent the juices from being exhaled, or carried off; and that the earth fhould be expofed for a confiderable time, before any more dung is laid on, that fo it may receive all the benefit from the air which it is capable of, before it is covered.

This kind of dung-hills is made with leaft expence upon the field for which the dung is intended. The head-ridges are commonly high raifed, by the turning of the ploughs upon them, and contain the richeft earth in the field. Thefe are very proper places for the dung-hills. The earth is at hand, and can eafily be thrown upon the dung.

Thofe that treat of dung-hills of this kind commonly recommend earth as oppofite as poffible to the nature of the foil upon which the dung is to be laid. They recommend clay for a light foil, and light earth for a clay foil. Befides, thefe the farmer cannot always command; and, though he can, will frequently find it very expenfive to carry them. It is probable, that there is not fo much in adapting the earth of the dung-hill to the kind of foil, as perfons, at firft fight, are apt to imagine. It is certain, that there cannot be fo much in it, as to anfwer the expence of fetching the earth. It is true, that, in many farms, there are different foils, and therefore the dung may be carried to a foil different from the foil of the field for which it is intended; there the dung-hill may be formed, and from thence carried to the field; but ftill this is an additional trouble and expence; and therefore this method is not to be followed, till, upon a comparative trial, the advantages are found to do more than anfwer the expence.

It is a practice in fome parts of Scotland, to lay clay upon clay land. This practice, it is faid, fucceeds very well, which makes it probable, that it is not very material what kind of earth is ufed for the compound dung-hill, provided it is of the abforbent kind; and, therefore, the farmer need not be anxious about getting earth different from his foil, but may make his compound dung-hill of the earth of the field which he intends to manure.

Farmers, efpecially if they live in countries that do not abound in cattle, may be apt to afk, where they are to get fufficient quantities of dung neceffary for carrying the practice of agriculture ftill nearer to perfection? M. de Tourbilly anfwers this queftion, by pointing out the following method of making an artificial manure.

" Before the winter fets in, fays he, that is about the middle of November at fartheft, hufbandmen fhould cleanfe all the yards, and out-lets belonging to the farm-houfe; lay them fmooth, and, if neceffary, dig away a little of their furface, till it is about a foot lower than the floor of their buildings; then if they have any common or wafte land, let them bring from thence fern, thiftles, and other coarfe weeds, cut down in full fap, at which time they are beft, or occafionally as they are wanted, and lay a bed of them, about two inches thick, upon the places thus prepared. If weeds cannot be got, coarfe wheat or rye ftraw may be ufed in their ftead, in beds about half as thick. A layer of earth, about fix inches deep, fhould be fpread upon this bed of weeds, or ftraw. Earth of a quality proper for the improvement of the foil intended to be manured, is undoubtedly the beft; though any earth, which in this cafe the farmer will dig as near to the houfe as he conveniently can, is preferable to the miftaken practice of paring off the upper foil, or turf, of the neareft common or wafte land, to mix with the artificial manure: for when poor ground has loft its furface or fward, it long remains a barren fpot, before a new foil, capable of affording root and nourifhment for grafs, can be formed upon it. If no proper earth lies nearer at hand, the farmer may take off the furface of any part of his plowed ground which lies too high, and is not at too great a diftance. But, as much as poffible, he fhould adapt the earth mixed with this manure to the nature of the land for which it is intended.

" This bed of litter and earth fhould be let lie about a fortnight, during which all fweepings and filth of the kitchen and houfe fhould be thrown upon it, that nothing may be loft, which can be converted into manure. The wetnefs of the feafon, and the paffing of men, cattle, and carriages, over this bed, will greatly contribute to rot it; to complete which, let the farmer turn in all his cattle of every kind, and drive them backward and forward over it, after rain has fallen. This will foon render it a kind of coarfe mud mixed with litter, which may be cleared away at the end of another fortnight. If it be too liquid, as it often is in rainy feafons, it fhould be laid up in little heaps, upon the fame place, till it be drained. Let it then be carried to a fufficiently capacious hole, or pit, dug for the purpofe in or near a corner of the farm-yard. This pit muft be in a dry place; for no manure fhould ever be laid in water, which would wafh away its unctuous parts, deftroy its heat, diffolve its falts, and even leffen its bulk confiderably, if it run off elfewhere. One load of ftable and other dung fhould be mixed with every two loads of this artificial compoft, as it is laid in the pit. The next day, another bed of litter and earth may be fpread in the yard, &c. as before; and, being managed in the fame manner, will be fit for carrying to the dung-pit in about another fortnight. Thus two fupplies of this artificial dung may be had every month, during the whole winter and part of the fpring.

" This work will not be expenfive: every body, even women and children may be employed at it, and it is done at a time of the year when labourers are leaft wanted in the field. It may be continued in the fummer: though the beds do not rot near fo foon in dry weather; two or three months being fometimes requifite then to bring them to a proper ftate, in the above method. However, this may be confiderably haftened, and much improved, by bringing cattle to lie upon them in the night,

night, unlefs they are in folds. The earth and other fubftances of this manure will be greatly enriched by their dung and urine, before it is carried to the ftercorary.

"As this laft made dung will not be fufficiently rotted by the next fowing feafon, the beft way is to lay it in a feparate pit, to mellow, for the enfuing year; and it will be ftill better, if kept two years. The other dung, made in a wetter feafon, and more thoroughly putrefied at firft, fhould remain about fix months in the pit, to ripen; and be wetted now and then in dry weather. During this time, it heats, ferments, and acquires an excellent quality. It may be made to fuit any foil, and agrees with many lands better than pure dung taken from the ftall or ftable, than which it is milder, lefs fiery, and more lafting. Farmers who have not a large yard belonging to their houfe, may make this compoft in any other p ace that beft fuits their convenience; and the poorer fort of peafants may do the fame. By mixing with it a third part of other dung, they triple their quantity of manure." *Memoirs fur les Defrichemens, p.* 78.

This eafy and profitable method of making artificial dung is likewife recommended by the ingenious author of the Differtation on Agriculture, publifhed in the Memoirs of the truly laudable Society eftablifhed at Berne, for the Improvement of rural Oeconomy.

"There are, fays he, two ways of meliorating land. One of them may be called natural, and the other artificial. The former confifts in a well proportioned mixture of two or three different kinds of earth, the refult of which is a new fort, more favourable to vegetation; and the latter in dung.

"Dung confifts of animal or vegetable fubftances, either actually putrefied, or in a ftate of putrefaction. It operates two ways upon the earth: firft, by conveying nourifhment to the plants which grow in it, as the air and water alfo do; and fecondly, by opening its pores and feparating its parts, by a kind of fermentation, till at laft it is itfelf converted into a kind of fine black mould.

"The only way to have plenty of this ufeful matter, without much expence, is by a mixture of ftraw or litter with the excrements of animals. Manure may be obtained from every part of animals or vegetables: but a quantity fufficient for a large extent of ground would coft too much. I therefore fhall not here fpeak of fawduft, tanner's bark, afhes, foot, linen or woollen rags, fhavings of horn, &c. of which quantities can be had only in the neighbourhood of populous towns; but fhall content myfelf with pointing out the means of increafing dung in countries diftant from great cities.

"Agriculture affords an ample field, and very abundant matter, for the moft ufeful of all experiments. Nothing would contribute more effectually to its improvement, nay, to the reducing of it to fixed and certain rules, than for proper perfons to try upon different pieces of ground, of fimilar fize and foil, fome of the principal methods pointed out by the moft intelligent in this art, and compare the iffue of their trials, and the feveral incidents attending them, during a courfe of years. This is particularly wanted in order to determine the effects, and the quantity moft proper to be ufed, of different manures. To this end, two or three fields of experiment might be fet apart, to be cultivated exactly according to a well chofen and well digefted plan. An exact account fhould alfo be kept of every occurrence, difburfement, and produce. Regularity is the foul of all bufinefs. Such journals, properly methodized, would give us a clear infight into rural Oeconomy, and fet order, affiduity, and frugality in fo advantageous a light, that every one would be forced to acknowledge them to be the fource of riches, and as fuch would be induced to practife them." *Tom.* II. *part* III. *page* 651.

DURZ'D, or *durz'd out*, an epithet applied in the northern counties to corn beaten out of the ears by the wind turning it in the field, or other accidents.

DWARF, an epithet applied to fuch trees and plants as are lefs than the common forts of the fame genus.

Dwarf-trees were formerly in much greater requeft than they are at prefent; for though they have fome advantages to recommend them, yet the difadvantages attending them greatly over-balance; and fince the introducing of efpaliers into Englifh gardens, dwarf-trees have been in little efteem, for the following reafons:

1. The figure of a dwarf-tree is very often fo much ftudied, that, in order to render the fhape beautiful, little care is taken to procure fruit, which is the principal defign in planting thefe trees.

2. The branches being fpread horizontally near the furface of the ground, render it very difficult to dig or clean the ground between them.

3. Their taking up too much room in a garden, efpecially when they are grown to a confiderable fize, for nothing can be fown or planted between them.

It is alfo very difficult to get to the middle of thefe dwarf-trees in the fummer, when their leaves and fruit are on the branches, without beating off fome of the fruit, and breaking the young fhoots; whereas the trees on an efpalier can at all times be come at on each fide, to tie up the new fhoots, or to difplace all vigorous ones, which, if left on, would rob the trees of their nourifhment.

Add to this, the fruit-buds of many forts of pears and apples are produced at the end of the former year's fhoot, which muft be fhortened in order to keep the dwarfs to their proper figure; fo that the fruit-buds are cut off, and a greater number of branches are obtained than can be permitted to ftand; fo that all thefe forts of fruit-trees, whofe branches require to be trained at full length, are very improper to train up as dwarfs.

Thefe evils being entirely remedied by training the trees to an efpalier, hath juftly gained them the preference. *Miller's Gard. Dict.*

DWARF-OAK, the name of a fhrub common in many parts of North America, where it is planted for making hedges and fences. It grows very faft, and becomes fo thick by cutting with fheers, that hardly a bird or moufe can creep through it when in full perfection. The acorns are fown in rows or drills, where the hedge is propofed to be made, which admits of being made of a confiderable height. Such a fence as this would be a fcreen from the winds in winter, as well as a fecurity to the inclofure; and therefore a hedge of this kind would be very ufeful here; and the plant would, perhaps, on further examination, be found capable of being ferviceable in fome other ways. *Mufeum Rufticum, vol.* VI. *p.* 293.

DYER's-WEED. *See the article* WELD.

E.

EADDISH, or *Eddiſh*, roughings, or graſs growing among the ſtubble, after the corn is cut.

EARING, or *Aring*, ploughing, tilling, cultivating.

EARNING, cheeſe-rennet.

EARTH, the ground, conſiſting of different modifications of terrene matter.

The earth, which generally preſents itſelf firſt to the eye, is no particular kind of ſoil, but, uſually, a mixture of the ſoil underneath, with every adventitious ſubſtance, either purpoſely brought to, or accidentally lodged upon it. From theſe cauſes, this ſuperficial earth, commonly called mould, grows and increaſes yearly in depth; oftentimes to ſuch a degree, as to form even conſiderable eminences, eſpecially where there has been a fall of woods and trees, ſuch as birch and beech, which, not being of a conſtitution to remain long in the ground without rotting, as fir, oak, elm, and ſome other timber will do, are pretty ſoon reduced into mould as ſoft and tender as that in which they were ſown or planted.

This ſurface-earth, and alſo the natural under-turf earth, to the depth of about a foot, is generally the beſt and ſweeteſt, being enriched with all that the air, dews, ſhowers, and celeſtial influences can contribute thereto: for that earth is beſt, and it is the ſame with water, which is moſt expoſed to the influences of the ſun and air. The fatneſs of the under-turf earth, drawn up to the ſurface by the kindly warmth of the ſun, ſpends but little of its vigour in the graſs and tender verdure which it produces, provided no rank weeds be permitted to grow and perfect their ſeeds; but maintains its natural force, and is therefore, of all uncultivated moulds, the moſt grateful to the huſbandman.

As the reſt of the ſubjacent earths approach this in virtue, ſo are they to be valued. Of theſe there are ſeveral kinds, diſtinguiſhable by their ſeveral conſtitutions. The beſt of them is black, fat, and at the ſame time porous, light, and ſufficiently tenacious, without any mixture of ſand. It riſes in pretty large pieces, and falls into duſt, of its own accord, after a ſhort expoſure to the air; but without crumbling altogether into duſt, which is the defect of a leſs perfect ſort.

This excellent black mould is fit for almoſt any thing, without much manure. The farmer is not always ſo happy as to meet with it: or if there be a ſmall depth of it, other, leſs fertile, ſoils lie underneath, ſuch as clay, gravel, ſand, &c. which require different treatment, according to their various qualities. Theſe ſoils often appear on the ſurface; and may be ſaid to be almoſt barren, till brought by art to anſwer the purpoſes of the huſbandman. In clays and ſtiff ſoils, the component particles have too cloſe an adheſion to admit the roots of plants with the eaſe requiſite for them properly to ſeek their food: and, on the other hand, ſand, and ſoils of a light nature, are too looſe to give the proper ſtability to plants, or to retain the mixture neceſſary to convey their nouriſhment into them. It will therefore be right, firſt, to ſhew how theſe extremes may moſt properly be corrected, and then point out the means of keeping the ſuperficial mould in conſtant heart, to uſe the language of farmers.

EARTH-BOARD, that part of a plough which turns over the earth. *See the article* PLOUGH.

EAVES, the edges of the roof that over-hang the walls of a building.

EDDER, the ſmall ſhoots of aſh, hazle, oak, &c. uſed for binding the tops of hedges.

EDDISH, the ſame with eaddiſh. *See* EADDISH.

EDGE, the extremity of a border.

EDGE-GROWN, come up uneven, not ripening all together.

EDGINGS, the ſeries of ſmall, but durable, plants, ſet round the edges or borders of flower-beds, &c. The beſt and moſt durable of all plants for this uſe is box, which, if well planted, and rightly managed, will continue in ſtrength and beauty for many years. The ſeaſons for planting this are the autumn, and very early in the ſpring; and the beſt ſpecies for this purpoſe is the dwarf Dutch box. The edgings of box are now only planted on the ſides of borders, next walls, and not, as was ſome time ſince the faſhion, all round borders or fruit-beds, in the middle of gardens, unleſs they have a gravel walk between them, in which caſe it ſerves to keep the border from waſhing down on the walks in hard rains, and fouling the gravel.

In the laſt age, it was alſo a very common practice to plant borders, or edgings, of aromatic herbs, as thyme, ſavory, hyſſop, lavender, and the like. But theſe are all apt to grow woody, and to be in part, or wholly, deſtroyed in hard winters. Daiſies, thrift, or ſea July flower, and chamomile, are alſo uſed by ſome for this purpoſe; but they require yearly tranſplanting, and a great deal of trouble, elſe they grow out of form; and theſe are alſo ſubject to periſh in very hard ſeaſons. *Miller's Gard. Dict.*

EDIFICE, a fabric, a building.

EFT, a newt, or evet.

ELBOW, a name given by horſemen to the hind-part of the fore-leg, pointing towards the briſket.

ELDER, fuel for fire.

ELDER, the udder.

ELDER, is alſo the name of a well-known tree, and is often uſed in making fences, which may be done by taking elder-ſticks, or truncheons, ten or twelve feet long, and ſticking them in the bank ſloping both ways, ſo as to form a kind of chequer work. By this means a fence may be ſooner raiſed than by any other, as the elder is a very quick grower. The wood, when large, is very uſeful for turners and mathematical inſtrument-makers, being nearly equal to the beſt box, and for many uſes ſurpaſſing it. *Mortimer's Huſbandry, vol. I. page 7.*

ELM, the name of a tree too well-known to need any deſcription, being common in almoſt every part of England.

Elms are very proper to be planted in hedge-rows, upon the borders of fields, where they will thrive much better than when planted in a wood, or cloſe plantation, nor will their ſhade be very injurious to whatever grows under them; but when theſe trees are tranſplanted out upon banks after this manner, the banks ſhould be well wrought and cleared from all other roots, otherwiſe the plants, being taken from a better ſoil, will not make much progreſs in theſe places. About Michaelmas will be a good time for this work, for the reaſons before aſſigned; but when they are planted, there ſhould be ſome ſtakes fixed in by them, to which they ſhould be faſtened, to prevent their being diſplaced by the winds; and part of their heads ſhould be taken off, before they are planted, which will alſo be of uſe in preventing their being eaſily overturned by winds; but by no means ſhould their leading ſhoot be ſtopped, nor their branches too cloſely cut off; for, if there are not ſome ſhoots left on to draw and attract the ſap, they will be in danger of miſcarrying.

Theſe trees are alſo proper to plant at a diſtance from a garden or building, to break the violence of winds, for which purpoſe there is not any tree more uſeful; for they may be trained up in form of an hedge, keeping them cut every year; which will cauſe them to grow very cloſe and handſome, to the height of forty or fifty feet, and be a great protection againſt the fury of winds: but they ſhould not be planted too near a garden, where fruit-trees, or other plants, are placed; becauſe the roots of the elm run ſuperficially near the top of the ground to a great diſtance, and will intermix with the roots of other trees, and deprive them of nouriſhment. Nor ſhould they be planted near gravel or graſs walks, which are deſigned to be well kept; becauſe the roots will run into them, and ſend forth ſuckers in great plenty; which will deface the walks, and render them unſightly.

But, for large gardens, where ſhade is required, there is ſcarce any tree ſo proper for that purpoſe, being eaſy to remove, when grown to a conſiderable ſize; ſo that a perſon who is willing to have his plantations for ſhade in a ſhort time, may procure trees of one foot circumference in their trunk, which will be in no danger of ſucceeding, provided they are removed with care. And theſe will take root, and grow again, almoſt as well as young plants, which is what few other ſorts of trees will do; but then they ſhould be ſuch trees as have been thus regularly trained up in a nurſery, and have good roots, and not ſuch as are taken out of hedge-rows, as is by ſome practiſed, which ſeldom riſe with any tolerable roots, and conſequently often miſcarry; and this has been the occaſion of ſo many plantations of theſe trees failing; for although ſome of them may live a few years, yet few of them are of long duration, and they rarely increaſe much in their ſtems, but frequently grow hollow, their heart decaying firſt; ſo that they are ſupported only by their bark or ſhell, for a few years, and the firſt ſevere winter, or very dry ſummer, they are generally deſtroyed.

In planting of theſe trees, great care ſhould be taken not to bury their roots too deep; which is very injurious to them, eſpecially if they are planted on a moiſt loam or clay; in which caſe, if the clay is near the ſurface, it will be the beſt way to raiſe the ground in an hill, where each tree is to be planted, which will advance their roots above the ſurface of the ground, ſo that they will not be in danger of rotting in winter with moiſture.

When theſe trees are propagated by ſuckers taken from the foot of old trees, they are commonly laid into the ground very cloſe in beds, where, in dry weather, they may be frequently watered, to encourage their putting out roots. In theſe beds they are left two years; by which time, thoſe that live will be well rooted, though a great many of them generally die; then they ſhould be tranſplanted into the nurſery.

There are ſome who raiſe the witch elm from ſeeds, which it generally produces in great plenty, and are ripe in April. Theſe ſhould be ſown upon a bed of freſh loamy earth, and gently covered; in dry weather they ſhould be watered, and if the bed is ſhaded from the violent heat of the ſun, it will be of great ſervice to the ſeeds, for I always obſerve the plants to come up better in the ſhade, than when expoſed to the ſun. When the plants come up, they ſhould be carefully cleared from weeds; and after they have ſtood two years in the ſeed-bed, they will be fit to plant out into the nurſery.

Sometimes the common Engliſh elm will produce ſeed; but it is not ſo conſtantly fruitful as the witch elm, which ſeldom fails to produce great quantities, when they have arrived to due maturity; which ſeeds will fall to the ground, and when they light upon a ſpot which is not diſturbed, the plants will come up in great plenty.

The timber of the common Engliſh elm is generally preferred to the reſt; though that of the witch elm is often as good, and is the largeſt tree, when planted on a kindly ſoil; but the Dutch elm affords the worſt timber, and never will grow to the ſtature of either of the other ſorts; ſo that this ſhould not be cultivated for the timber; therefore the beſt way to be ſure of the kinds which a perſon would chuſe to propagate, is to have a nurſery of ſtools, in order to furniſh layers; for when they are grubbed up from hedge-rows, there will often be many ſorts intermixed, eſpecially if the people who go about to gather them, furniſh them; becauſe they take them indifferently, wherever they can procure them; ſo that when they are planted out thus blended together, there will be a conſiderable difference in their growths, which will deface the plantation. *Miller's Gard. Dict.*

A correſpondent of the editors of the Muſeum Ruſticum has favoured the public with the following account of an experiment of planting elms on a ſtiff clay.

"My original deſign, ſays he, was to plant a clump of trees to the north-eaſt, a ſecond to the ſouth-weſt of my houſe, and alſo to plant four rows of elms from the front of my houſe to the village, being about two hundred yards diſtant.

"My firſt buſineſs in this grand affair was to lay a plan of operations: accordingly, I marked out the ground for my two clumps, and my avenue, driving a ſmall ſtake in the ſpot where every tree was to be planted. For the avenue the ſtakes were placed in four rows, two on each ſide, thirty feet diſtant from ſtake to ſtake, the avenue in the middle thirty feet wide, and the rows diſtant twenty-four feet from each other.

"My clumps I planted in triangles, one of the points being to the wind, imagining this form would beſt anſwer the intended purpoſe, each clump conſiſting of about one hundred and fifty trees. This preparation was made by me during the ſummer of the year 1737.

"As ſoon as harveſt was over, the ſame year, I hired ſome labourers, and made them dig a hole ſix feet ſquare, and four feet deep, wherever they found a ſtake, throwing the earth which came out of the hole round its edges.

"When this work was done, I left it in the above ſtate all that winter and the enſuing ſummer, with an intent that the ſtiff obſtinate nature of the clay ſhould be meliorated by the powerful influences of the froſts, ſun, and variable air.

"At the end of the ſummer of 1738, I found I had not loſt my labour, when I came to examine the ſtate of my experiment. The nature of the ſoil, wherever the air could operate upon it, was entirely changed, the clay being much leſs compact, and approaching nearer to the ſubſtance of a ſtiff loam, being crumbly, though cloſe in its texture.

"As ſoon as I found that my land was thus in proper order for planting, I procured from a nurſery-man a ſufficient number of young elm-trees, ordering him to mark the north ſide of every one of them with ſome white paint, previous to his taking them up.

"This was a precaution ſome might think unneceſſary; but my reaſon for doing it was, becauſe I imagined that a tree, removed from its native ſpot, and tranſplanted into another place, muſt thrive better, if, on being removed, it enjoyed the ſame aſpects as before; and indeed ſome ſmall experiment I had before made in this matter ſeemed to confirm me in the opinion.

"As ſoon as I had beſpoke my trees, I employed ſome labourers to fill up the holes above-mentioned with the earth that came out of them; but I firſt ſprinkled ſome ſlaked lime over the bottom of each hole, and mixed lime with the earth as it was thrown in, to the quantity of a buſhel for each hole.

"When this work was done, and the ground appeared level, with a little ſpare earth near each hole, I had my trees planted in the following manner:

"I began planting my trees about the tenth of October, and had finiſhed by the latter end of the month.

"I cauſed, in the firſt place, the roots to be moderately trimmed with a very ſharp knife, each root being cut ſloping, not tranſverſely, the ſlope being undermoſt or next the ground: this was, in ſome meaſure, eſſential, to prevent the moiſture proceeding from rain from ſoaking into the wounded part.

"Having proceeded thus far, I cauſed a tree to be ſet over each hole, upon the ſurface of the ground, round the roots of which ſome under-turf earth was piled, and over that the remainder of the natural ſoil, with which ſome flaked lime had been mixed.

"The upper part of the little hillock, formed round the roots of the tree, was made a little hollow, to convey to the plant as much rain as would be neceſſary to ſupply it with a ſufficient quantity of moiſture.

"I then employed a perſon to ſecure the little mound with brambles, wattled in the ſame manner as are the graves in a country church-yard; my laſt buſineſs being to apply ſome long ſtakes to each tree, by way of ſupporting it, till it had taken firm root.

"In this manner, then, I planted the whole number of my trees; and they ſucceeded to a wonder, for but ten failed; and the bark of thoſe was, on examination, found to have been injured by an aſs which broke into my ground: however, the next year I had them replaced, and the diſadvantage was not great.

"What is moſt remarkable is, that my trees ſtood well the memorable hard froſt, without being, as far as I could find, in the leaſt injured.

"I now, with pleaſure, view the fruits of my former labours; and I cannot find that any perſon, within twenty miles of me, has finer trees, that have been no longer planted.

"I well knew, that the only way to defend the roots of my young trees from the damp, raw, under earth, which had proved fatal to other plantations, was, to raiſe them above it: this I effected, by planting them on the ſurface of the ſoil; and ſuch roots as ſtruck downward found a good warm bed in the earth, which had been ſtirred and mixed with lime: however, as the elm has naturally a ſpreading root, the nouriſhment was chiefly extracted from the upper bed of earth, the main roots being covered by only a few inches of mould, and ſome of them, at this time, lie quite bare and prominent above the earth.

"A great deal depends on ſtaking young trees ſo ſecurely that they ſhall not be ſhaken by every guſt of wind, in ſuch a manner as to diſplace their roots in the earth; for by this means the fibres of the roots of ſuch ſhaken trees are removed from the ſurfaces which ſhould afford them nouriſhment; and either the tree dies, or the mouths of the roots muſt again have time ſo to adapt themſelves to the circumjacent particles of earth, as to be in a capacity of once more extracting their nouriſhment and food from their common mother.

"The trees in my avenue do not now ſeem as if they were planted on the ſurface; for I have, to make the way hard and good, ſince laid many loads of gravel in the middle ſpace, and between the trees: this, together with the trees ſettling a little after planting, as moſt trees do, has made the whole appear near level." *Muſeum Ruſticum, vol.* IV. *page* 154.

Mr. Dodart, in a diſcourſe made before the Paris academy, on the great fecundity of vegetables, and their prodigious increaſe, choſe this tree as an example of it. He obſerved an elm of about ſix inches diameter in the body, and about twenty feet high to the branches; he ordered one of the branches to be cut off, and, without reckoning the ſeeds which had been ſhaken off by the blows of the weapon, or loſt by the fall, he counted the reſt only which remained on. This branch was about eight feet long, and on this there were 16450 ſeeds. Counting in a very moderate way, there muſt be reckoned, at leaſt, ten ſuch branches as this, on an elm of that growth. The product of theſe ten branches will be then 164500 ſeeds.

All the branches which are ſhorter than eight feet, on the ſame tree, taken together, on a moſt moderate computation, muſt be allowed to make a ſurface more than double that of theſe ten branches. The product of this ſurface of the ſhort branches, therefore, will be 329000.

An elm may very reaſonably be ſuppoſed to live a hundred years, and as the elm, here mentioned, was but of twelve years growth, it cannot be ſuppoſed, in that ſtate, to be yet arrived at its middle degree of fertility in ſeeds; therefore the ſmalleſt addition that can be made to the 329000, will bring it to at leaſt 330000, for the mean yearly product of ſeeds of the tree; and to know what is the whole product of an elm in ſeeds, according to this computation, this ſum muſt be multiplied by a hundred, the number of years of the duration of the tree. Thus the ſmalleſt amount will be thirty-three millions of ſeeds, produced by an elm originally raiſed from one ſingle ſeed.

This, however, is no more than the natural produce of the tree, in its wild ſtate; we all know very well, that proper management will make trees yield abundantly more fruit than they naturally would. Thus, if this elm, at a proper ſtage of its growth, had been lopped off at the head, it would have puſhed out infinitely more numerous branches; and a ſet of theſe would have appeared in a circle round the trunk, at about half an inch from the place where it was cut off, and this would have been the caſe in whatever part, or at whatever height, it had been cut. All the trunk of the tree, from the ground up to the beginning of the natural eruption of the branches, being then full of theſe rudiments of branches, placed in circles, and ſeparated by circular ſpaces of about half an inch deep, compoſes ſo many circles of branches, or rudiments of branches, as there are half inches in meaſure from the ground up to the firſt natural rudiments; all theſe rudiments are formed, therefore, all ready to appear in form of complete branches, and all contain, in miniature, their proportion of ſeeds, and any circle of them may be made to ſhoot out and appear, by only cutting off the trunk juſt above them; theſe are all, therefore, to be allowed really to exiſt, and all to be brought into the account of the providence of nature, in the fecundity of the tree, as all are formed and provided for it. There are, therefore, evidently contained, in the elm, ſo many times thirty-three millions of ſeeds, as there are half inches in twenty feet, which was its meaſure from the ground to the firſt branches: that is to ſay, this tree contains actually in itſelf 15840000000 rudiments of ſeeds, or has ſo many bodies incloſed in itſelf, by each, or any one of which, it is capable of multiplying its ſpecies, and of producing ſo great and aſtoniſhing a number of trees. The imagination is ſtartled at being conducted to ſo amazing a ſcene by reaſon.

What are we to think then of the immenſity of the works of the great Creator of the univerſe, when we conſider that every one of theſe ſeeds contains in itſelf a tree, loaded with an equal number of ſeeds, and each of thoſe another tree, loaded in the ſame manner, and ſo on, beyond the utmoſt extent of our capacity; and that conſequently here is a geometrical proportion, or progreſſion of increaſe, the firſt term of which is 1, the ſecond 15840000000, the third the ſquare of that number, the fourth the cube, and ſo on to infinity. Reaſon and imagination are loſt together in the immenſity of ſuch a calculation! *Mem. Acad. Par.* 1700.

ELSHIN, a pail, kit, or bucket.

ENDIVE, or ſuccory, a plant much cultivated in kitchen gardens.

It is propagated by ſeeds, which are longiſh, flat at one end, and roundiſh at the other, not unlike to little bits of ſmall ſtalks. Thoſe of the white, the green, and the curled, which are the ſorts cultivated in the kitchen garden, are of a whitiſh grey colour. The ſeeds of the wild ſuccory, which is uſed for medicinal purpoſes, are black, but of the ſame ſhape as the former. All the ſorts of endive are eſteemed aperitive and diuretic. They will grow in almoſt any ſoil, but thrive by far the beſt in deep, good, and well looſened mould. The management of each ſort is the ſame.

The

The curled endive is the sort now most cultivated in England for sallads in the autumn and winter, during which it may be continued in perfection, so long as the season will permit, by observing the following directions.

The first sowing of endive should be about the middle of June; for that which is sown earlier is apt to run up to seed, especially if the ground be rich, and the situation warm, before the plants have arrived to a proper size for blanching. The second sowing should be in the beginning of July, and the third and last about the middle of the same month. The plants of each of these sowings will be so very different in their growth, that each bed will afford a succession of two or three crops, and the three sowings will of course furnish an uninterrupted supply during the whole season.

The plants must be well weeded, and frequently watered in dry weather, till they are fit to transplant. A spot of rich ground, proportioned to the number of plants intended to be set in it, should then be prepared for them, by thorough digging, and laying of its surface smooth; and, if it be very dry, it must be well watered. The largest plants should be removed first from the seed-bed, and the smaller ones should be left there to gather strength, which they will soon do after the additional room for their farther growth, so as, in their turns, to be fit also for transplanting. Care must be taken not to break their roots in drawing them up from the seed-bed; and if the tops of their leaves are shortened then to nearly equal lengths, and they are spread with all their roots turned the same way, these little precautions will render the regular planting of them much easier, than when their heads and tails are jumbled promiscuously together. They should be transplanted in rows at least one foot asunder, and set ten inches apart in the rows. The earth should be well closed around their roots, and they should be well watered every other evening till they have taken good root, after which they must be kept clear from weeds.

If the plants left in the seed-bed are also well weeded and watered, a second transplantation may be made from thence in about ten days or a fortnight after the first, and the remainder of them will be fit to transplant, in the same manner as before, at about the same farther distance of time.

The plants that were first transplanted will be fit for blanching by the latter end of August at farthest. To do this properly, the gardener should grasp in one hand all the inner leaves of the plant, in regular order, and then collect over them the outside sound ones; for the rotten and decayed leaves, which lie next to the ground, should be pulled off and thrown away. The leaves thus gathered up should be placed as nearly as can be in the natural order of their growth, so as not to cross one another, and when the whole plant is thus collected, it should be tied up very close with a twig of osier, or a strong slip of bass mat, at about two inches below the top. This should be done in a very dry afternoon, when the middle of the plants is perfectly free from dew or rain: for any such moisture tied up in them, would soon make them rot. In about a week after this, these plants should be tied again round the middle, to prevent their heart-leaves from bursting out on one side, which they are otherwise apt to do, as they increase in bulk; and with this management they will be quite blanched in three weeks or a month, from the time of the first tying up. The largest plants should always be tied up first; so that by going over the same ground once a week, and taking them according to their size, the crop will be continued longer than if they were all tied up at once: for they will not hold sound and good above ten days or a fortnight after their blanching has been completed, especially if the season prove wet. For this reason it is most advisable to sow and plant at different times, as before directed. But it is to be observed, that all the plants of the last sowing should be transplanted under pales, walls, or hedges, to screen them from frost; and if the winter be severe, they should also be covered with peas-haulm, or some other light covering, which should be carefully taken off in mild weather: and these borders must likewise be as dry as possible; for endive is very liable to rot, if planted in moist ground in the winter.

Only the plants of the two first sowings are to be tied up in order to blanch them: for, after October, when the nights begin to be frosty, the plants of the late crop would be in great danger of being killed thereby, if they were to be left entirely above ground, even though they should be covered with haulm. The best way of managing these, is to take them up in a very dry day, and with a large flat pointed dibble, plant them in the sides of ridges of earth laid very upright, facing the sun, with only the tops of the plants out of the ground. The plants thus situated will be exposed to as little wet as possible, for rain cannot then lodge upon them, and in about three weeks or a month's time they will be blanched fit for use: but they will not keep good long after that. Fresh ones should therefore be planted in this manner every week or fortnight at farthest, by those who would have a constant supply for the table; and if those which were transplanted from the seed-beds are kept till February or March, before they are thus set to blanch, sallads of endive may be had regularly till the beginning of April, or later. This last planting will continue good longer than that which was made just before the beginning of winter; because, as the days increase in length, the sun grows warmer, and the too great moisture of the earth, which would endanger the rotting of the plants, is more and more exhaled.

When the endive, blanched either way, is fit for use, it should be dug up with a spade, and after its outside green and decayed leaves have been stripped off, it should be thoroughly washed in two or three different waters, to clear it from slugs and other vermin which commonly shelter themselves among its leaves.

If any of the plants should put out flower-stems either before or during the time of their blanching, they should be immediately pulled up, and thrown away.

In order to have good seeds of endive for the next season, some of the largest, soundest, and most curled plants, (a dozen of such will yield seeds enough for any middling family,) should be chosen from among the borders where the last crop was transplanted, before the rest of it is put into the ridges to blanch. These selected plants should be carefully taken up, in the beginning of March, if the weather is mild, otherwise it may be deferred a fortnight longer, and transplanted into a well sheltered place, at the distance of about eighteen inches asunder, in one row, which should be placed pretty near to the fence, whether it be wall, pale, or hedge; but not too near, especially if it be the former, because the danger of frosts and nipping winds is greatest quite close to a wall. These plants should be kept very clear from weeds, a deep stirring or two of the earth will give them great vigour, and when their stems begin to advance in height, they should be supported by a string run along before them, and fastened at each end, either to the fence, or to stakes set up for this purpose. About the beginning of July, these seeds will begin to ripen. As soon as they are quite ripe, the stalks must be cut off, and spread upon a coarse cloth, to dry in the sun. They should then be beaten out, dried again in the sun, and laid up in bags, or paper, in a dry place. But a circumstance of some moment here is, that it would be wrong to wait for the ripening of all the seeds of the same plant, because, such is their irregularity in this respect, the first ripe and best of the seeds will scatter and be lost, before the others are near ripe.

ERSH, the stubble after the corn is cut.

ERGOT, a sort of stub, like a piece of soft horn, placed behind and below the pastern joint.

ESCALLION. *See the article* SCALLION.

ESCALLIOT, a species of onion, much cultivated in gardens.

These plants are propagated by off-sets from the roots, and planting them in a light soil; for though they will grow in almost any ground, they will increase most plentifully there.

The best time for setting is towards the end of January. They must be taken up as soon as their leaves begin to wither; for they will rot if left long after in the ground.

ESPALIERS, in gardening, are rows of trees planted about a whole garden or plantation, or in hedges, so as to inclose quarters or separate parts of a garden; and are trained up regularly to a lattice of wood-work in a close hedge, for the defence of tender plants against the injuries of wind and weather. They are of admirable ufe and beauty in a kitchin garden, ferving not only to fhelter the tender plants, but fcreen them from the fight of perfons in the walks.

The trees chiefly planted for efpaliers, are apples, pears, and fome plums; but the two former are moftly ufed: fome plant efpaliers of apples grafted upon paradife ftocks; but thefe being of a fhort duration, are not fo proper for this purpofe; therefore I fhould rather advife the having them upon crab-ftocks, or (if in fmall gardens, where the trees cannot be allowed to grow fo high) upon what the gardeners call the Dutch ftock, which will caufe them to bear much fooner, and prevent their growing too luxuriant.

In chufing the trees for an efpalier, endeavour, as near as poffible, to plant the feveral forts which are nearly of the fame growth in one line, that the efpalier may be the more regular, and of an equal height, which greatly adds to their beauty; for if you plant trees which fhoot very unequally in the fame line, it will be impoffible to make the efpalier regular: befides, the diftance the trees are to be planted muft be directed hereby; for fome trees, viz. thofe of a larger growth, fhould be planted twenty-five or thirty feet afunder; whereas thofe of fmaller growth need not be above fixteen or eighteen feet diftance from each other.

The width of the walks between thefe efpaliers fhould (in a large garden) be fourteen or fixteen feet at leaft; and, if they are defigned to be carried up pretty high, the diftance fhould be greater, that each fide may receive the advantage of the fun and air, which is abfolutely neceffary, if you would have the fruit well tafted: and if your ground is fo fituated, that you are at full liberty which way to make the efpaliers, I would advife the placing the lines from the eaft a little inclining to the fouth, and toward the weft a little inclining to the north, that the fun may fhine between the rows in the morning and evening, when it is low; for in the middle of the day, when the fun is advanced far above the horizon, it will fhine over the tops of the efpaliers, and reach the furface of the earth about their roots; which is a matter of more confequence than many people are aware of.

The forts of apples proper for efpaliers are the golden pippin, nonpareil, rennette grife, aromatic pippin, Holland pippin, French pippin, Wheeler's ruffet, Pile's ruffet, with feveral others.

The forts of pears proper for an efpalier are fummer and autumn fruits; for fome of the winter pears feldom fucceed well in an efpalier. Thefe trees, if defigned for a ftrong moift foil, fhould be upon quince ftocks; but if for a dry foil, upon free ftocks. Their diftance of planting muft alfo be regulated by the growth of the trees, which are more unequal in pears than apples, and fhould therefore be more carefully examined before they are planted. As for thofe pears upon free ftocks, the diftance fhould never be lefs than twenty-five feet for moderate growing trees; but, for vigorous fhooters, the fpace of thirty or five and thirty feet is little enough, efpecially if the foil be ftrong, in which cafe they fhould be planted at a greater diftance. The particular forts of pears I would recommend for an efpalier, are the jargonelle, blanguette, poir fans peau, fummer boncretien, Hambden's burgamot, poir du prince, autumn burgamot, l'ambrette, gros rouffelet, chaumontelle, beurre du roy, le marquis, creffane, with many others of lefs note, always remembering that thofe pears which are of the melting kind, will do better in efpaliers than the breaking pears, which feldom ripen well on efpaliers: you fhould alfo be careful of the ftocks thefe are grafted on; for if the breaking pears are grafted on quince ftocks, the fruits will be ftony.

I fhall now give directions for making the efpalier, to which the trees are to be trained: but this I would not have done until the third year after the trees are planted; for, while they are young, it will be fufficient to drive a few fhort ftakes into the ground on each fide of the trees, to which the branches fhould be faftened in an horizontal pofition, as they are produced; which ftakes may be placed nearer, or at a farther diftance, according as the fhoots produced may require, and will be fufficient for the three firft years; for fhould you frame the efpalier the firft years the trees are planted, the poles would rot before the efpalier is covered. The cheapeft method to make thefe efpaliers is with afh poles, of which you fhould have two forts; one of the largeft fize, which contains thirteen poles in a bundle, and the other fize thofe of half a hundred; the firft or largeft fize poles fhould be cut about feven feet and a half long; thefe are intended for upright ftakes, and muft be fharpened at the largeft end, that they may, with more eafe, be driven into the ground; thefe fhould be placed at a foot diftance from each other in a direct line, and of an equal height, about fix feet above ground; then you fhould nail a row of ftrait flender poles along upon the tops of the upright ftakes, which will keep them exactly even, and continue to crofs the ftakes with the fmaller poles, and the tops which were cut off from the larger ones, at about nine inches diftance, row from row, from the top to the bottom of the ftakes. Thefe rows of poles fhould be faftened with wire, and the largeft end of the poles fhould be nailed to the upright ftakes, which will fecure the efpalier almoft as long as the poles will endure; whereas, if your faftening is not ftrong, the poles will be continually difplaced with every ftrong wind. When your efpalier is thus framed, you muft faften the branches of the trees thereto, either with fmall ofier twigs, or fome fuch binding, obferving to train them in an horizontal pofition, and at equal diftances; being careful not to crofs any of the branches, nor to lay them in too thick: the diftance I would allow for the branches of pears and apples, fhould be proportioned according to the fize of their fruit; fuch of them whofe fruit is large, as the fummer boncretien, monfieur John, and beurre du roy pears, and the rennette guife, Holland pippin, French peppin, and other large apples, fhould have their branches fix or eight inches diftance at leaft; and to thofe of leffer growth four or five inches will be fufficient.

But, befides this fort of efpalier made with poles, there is another fort that is by many people preferred, which is framed with fquare timbers cut to any fize, according to the ftrength thereof, or the expence the owner is willing to go to; thefe, though they appear more fightly, when well fixed and painted, are not of longer duration than one of the former, provided it is well made, and the poles are ftrong which are fet upright; nor will they anfwer the purpofe better, though they are vaftly more expenfive; for the greateft beauty confifts in the difpofing the branches of the tree, which, efpecially in fummer, when the leaves are on, will entirely hide from the fight the frame of the efpalier: therefore all expence in erecting thefe is needlefs, farther than making provifion to fecure the branches of the trees in a regular order.

Fruit-trees thus planted, and well managed, are much preferable to thofe trained up in any other figure, upon feveral accounts: as, firft, thefe take up very little room in a garden, fo as to be hurtful to the plants which grow in the quarters; and, fecondly, the fruit upon thefe are better tafted than thofe which grow upon dwarfs, the fun and air having freer accefs to every part of the tree, whereby the dampnefs arifing from the ground is fooner diffipated; which is of fingular advantage to fruit-trees. *Miller's Gard. Dict.*

ESPARCET, the fame with faintfoin. *See the article* SAINTFOIN.

ESSE, a provincial word ufed in Chefhire, to fignify afhes.

ETCH, the fame with erfh. *See* ERSH.

EVERLASTING-PEA, or broad leaved chickling vetch, a perennial plant, which grows naturally in fome parts of England, is eafily cultivated, and the root yields every year a great burden of excellent provender.

Thefe are great inducements for encouraging the cultivation of this plant, which feems adapted to any foil.

" I fowed three years ago, fays a writer in the Mufeum Rufticum, a rood of land, light, and but poor in quality, with this feed: this work was done early in the fpring, the land being prepared as for barley.

" I fowed it not in the broad-caft way, as I fhould have found much more difficulty to keep down the weeds; but I caufed a flight furrow to be drawn the length of the

the land with a light plough; and when the feed was thinly fprained, or rather dropped into this, another was drawn at a foot diftance, in which the feed was dropped in like manner.

"An interval, or fallow fpace, was then left at leaft two feet wide; then two more rows of the vetches, till the whole land was fown. I muft obferve, that I covered the feed by means of a light harrow with wooden tines, drawn backward and forward acrofs the land.

"When the plants came up, I had them well hoed, to clear the ground of weeds; and when they grew a little ftrong, they were fet out with the hoe to about a foot diftance in the rows, that they might have room to fpread and branch.

"The firft year they yielded no great quantity of fodder, but they have fince made me ample amends.

"The fecond fpring they came up very ftrong and vigorous, branching out much; and when I turned a couple of horfes in to feed, they were very fond of it, eating it very greedily, though they were taken out of a good, natural upland pafture.

"This laft fummer the land was almoft entirely covered, and it yielded a great deal of feed indeed: for experiment fake I caufed a few rods to be mowed juft before it flowered, and it made good hay, fweet, without being fticky.

"Before I conclude, give me leave to obferve, that when I had cut a few rods of the everlafting-pea, to make into hay, a fmall quantity of it was, by accident, fpread thin upon the ground, fo as to receive the full action of the fun's rays: this was, in a manner, fpoiled, becoming quite dry, infipid, and brittle, and almoft all the leaves dropping off; but the remaining part, which was dried either in fmall cocks, or thick fwarths, made excellent hay. I am, however, perfuaded that the laft method is by much the beft." *Mufeum Rufticum, vol. I. p.* 468.

EWE, the female fheep. *See the article* SHEEP.

Mr. Ellis, in his Treatife on Sheep, has given us the following fecret, which he pofitively afferts will make ewes take ram, at any time of the year. "Separate, fays he, fix or more of your ewes from the flock, and give to each half a pint of ftrong ale, or the fame quantity of good October, mellow, filky beer, and not that which is fharp by ftalenefs; and for giving it in the eafieft and fafeft manner, you may run the ale or beer through a funnel into the ewe's mouth; and when the ewes have been all thus ferved, put them into a proper place, not too large, nor too narrow, that the ewes may be confined with one or more rams, that have been before a little better kept than ordinary for this purpofe. Out of fix ewes, that I have known to take ram in this manner, not one of them has failed proving with lamb. By the above method, and the affiftance of a fufficient number of hands, an hundred ewes may be thus dofed with ftrong drink, and if rams enough are provided, they will all prefently take ram." *Ellis on Sheep, page* 297.

EXERCISE, a proper agitation given to an animal body, in order to produce falutary effects.

Exercife duly given to horfes that are well fed, is not only the beft means of all others to prevent ill habits, but to preferve them in a perfect ftate of health: for exercife converts the food into good and wholefome nourifhment, it promotes the circulation of the blood, and all the glandular difcharges, fo as greatly to enliven the body, and to make way for frefh fupplies of aliment. It invigorates the fpirits, gives ftrength and firmnefs to the mufcles and finews, and enables a horfe to endure labour. And when exercife is given abroad, in an open free air, it adds greatly to a horfe's vigour, and prevents any difpofition to putrid cohefions in the blood, which a clofe ftagnated air often produce, and this efpecially when horfes are young, and their appetites ftrong; for indeed when horfes grow old, their appetites are more moderate, and reft is oftentimes more agreeable to them than labour. Neverthelefs, exercife is, more or lefs, abfolutely neceffary for all horfes, young or old: for we may obferve, even old horfes, when they lie much ftill, though they are not apt, as young horfes, to turn directly fick, and fall into fevers: yet as their blood grows poor, and languid with age, they become fubject to many infirmities, as fwellings of their fheath and bellies, with other dropfical fymptoms, and fometimes to obftinate eruptions on their fkins, which exercife in a proper degree often prevents.

Horfes, by their natural activity, are every way fuited to exercife and labour, and in that refpect are more ufeful than any other of the brute creatures; only it depends on us, how they are to be treated, both for their own prefervation, and our benefit; and their food ought always to be proportioned according to their exercife. But the time and manner of a horfe's exercife is alfo to be regarded, for if he happens either to be worked at an unfeafonable time, or beyond his ftrength, it will be more injurious to him than if he had not been worked at all. Therefore this general caution is always needful, viz. never to ride a horfe hard, or put him upon any violent exercife when he hath been newly fed, and has his belly full of meat or water; but fhould be moved out at firft gently, and he will naturally mend his pace, as his food and water begins to affuage, when his rider may urge him on to further fpeed, as his bufinefs may require.

I need not tell any one, that when a horfe is hot with riding, or any other fharp laborious exercife, he fhould be cooled by degrees, this being known to almoft every ftable boy, from cuftom and ufe, though it is often neglected, through ignorance or idlenefs, or done with little judgment. And, therefore, when a man has travelled hard upon a journey, or when horfes have been driven hard in a coach or chaife, it is not fufficient, after they come to their bating place, or to the end of their day's journey, to walk them about in hand for half an hour or more, which is ufually done, but their pace fhould alfo be flackened for a mile or two before they come in, and after that, fhould alfo be walked fome time in hand, that they may cool gradually before they are brought into the ftable, with a thin cloth laid over each, if they have been ufed to it. This is the fafeft way with young horfes, that have been kept well, and have worked but little. And when fuch horfes come late to the end of their day's journey, or when the weather is fo bad, that they cannot be walked about in hand, they fhould then be well rubbed all over their bodies and limbs, till they are quite cool, without taking off their harnefs and faddles, and when cloathed; for when all the fmalleft blood veffels are replete and full, as they muft unavoidably be in all ftrong, and efpecially in long continued exercife, and the blood extremely heated, and running like a torrent, any fudden chill or damp will produce ftoppages and obftructions, where the veffels are the moft minute and fmall, or wherever there is the greateft weaknefs and relaxation, fometimes inwardly in the lungs, fometimes in the liver and kidneys, and fometimes in the ftomach and guts, and other membraneous parts; and this is ufually followed with inward pain, and inflammation, or with great dulnefs and heavinefs, which, in the end, often produce many untoward diforders; or if the limbs happen to be weak and relaxed, the blood and juices will foon drop down and ftagnate there, fo as to produce fwellings, and fometimes ulcerations, that are troublefome enough to remove, efpecially in thofe that have been little accuftomed to fuch kind of labour; for habit and ufe, in continued exercife, alters the cafe very much, becaufe that ftrengthens and invigorates the nerves and finews, as we obferve in fome hackney or job horfes, which are fo feafoned to their work, that fcarce any thing can hurt them. Indeed fome of the job horfes, that we fee endure fo much labour, are naturally ftrong, and very hardy, and have at firft been carefully managed by their owners, who are not able to bear the lofs of cattle, as gentlemen or men of fortune; and, therefore, we fee them generally, both begin and end their work with great coolnefs, and when they chance to meet with horfes that they find unable to go through their hard work, they ufually make their bufinefs only a mere play, that they may not lofe their flefh, until they can difpofe of them to the beft advantage. Another neceffary caution for the prefervation of our horfes, is never to feed them too foon, after they have been heated with exercife. *Gibfon's Farriery, vol.* I. *page* 182.

EXOTIC, foreign, not produced in our own country. Thus foreign plants and trees are called exotics, or exotic plants.

EXPERIMENT, a trial of any kind; an eſſay made in order to diſcover an uncertain, or unknown effect.

For the ſeveral experiments made on wheat, barley, &c. *ſee the proper articles* WHEAT, BARLEY, &c.

EXPOSURE, is the ſituation or aſpect of a garden or wall, with reſpect to the ſun and winds, and is therefore as various as the points of the compaſs, being either direct, as eaſt, weſt, north, or ſouth, or declining, as ſouth-eaſt, ſouth-weſt, &c. A garden ſloping to the ſouth is ſaid to have a ſouth expoſure or aſpect, or a wall with trees facing the eaſt, is ſaid to have an eaſt expoſure; the ſouth by eaſt, or ſouth ſouth-eaſt points, are generally reckoned the beſt expoſures for gardens, by reaſon they will enjoy the benefit of the morning ſun, and be leſs expoſed to the injuries of the weſt and ſouth-weſt winds, which in this climate are the moſt violent: the next beſt aſpect is the ſouth, particularly if the land is moiſt, but if it is of a dry nature, its product is very apt to be burnt up in hot ſummers, though it extremely well ſuits winter crops. With reſpect to walls, we would give the preference to the ſouth or ſouth-weſt expoſure for tender fruits; for although the eaſtern aſpect receives the invigorating rays of the ſun in the morning, yet the tender bloſſoms are very liable to be deſtroyed by the dry eaſterly winds, which generally prevail at the time the trees are in flower; therefore a wall with trees inclining a little to the weſtward of the ſouth, hath this advantage, that the bloſſoms receive but little damage from the froſts, which melt before the ſun comes to ſhine on them, and fall off like dew, without doing much harm; however, as there will be contrary aſpects, theſe may be planted with ſuch ſorts of fruits as do not require ſo much heat to ripen them; and wherever there are north aſpected walls, they are only fit for baking pears and plums, morello cherries for preſerving; or ſome duke cherries may be thus continued longer in the ſeaſon, as there is a month difference between the ripening on one ſide of the wall, and on the other.

EYE, the organ of ſight in an animal body; or that which repreſents objects to the mind.

The goodneſs or badneſs of the eyes of horſes is a thing wherein the beſt judges are ſometimes miſtaken; for moſt people regard the clearneſs and tranſparency of the eye, which indeed ought to be conſidered: but it is worth obſerving, that horſes, before they are ſix years old, have not that tranſparency in their eyes which they arrive at afterwards, becauſe while they are young and growing, their juices are viſcid and balſamic; ſo that their eyes look thicker or clearer, in proportion as their blood and juices happen to be more or leſs in a good ſtate. The ſame may be obſerved in all horſes that have colds, when the veſſels of the eyes are full: the eyes at that time look thick, and ſometimes inflamed, and a blow on the eye, or a bite, will have the ſame effect, when there is not the leaſt danger of blindneſs.

It is not, therefore, always the clearneſs of the eye that denotes its goodneſs, but a man is alſo to form his judgment from other indications, particularly from the form and manner of the eye, which includes not only the body of the eye, but the eye-lids, eye-brows, and all the parts belonging to it. Many good eyed horſes have a heavineſs in their countenance, with a lowering-brow, yet great numbers of this aſpect go blind with cataracts when they are about ſeven years old, or between ſeven or eight, and ſometimes later. Theſe are the moſt ſuſpicious where there is a bunch or fullneſs between the upper eye-lid and the eye-brow, with a fullneſs round the under eye-lid; ſo that the eye appears as if it was invironed in a ring. Such horſes are often fleſhy about the head and jaws, which, upon every cold, or rather ſlight accident, expoſes them to defluxions in their eyes.

When the eye is extremely flat or ſunk within its orbit, it is always a bad ſign, even though there be no defluxion or humour upon it: a ſmall pig-eye is none of the beſt, nor a large gogling eye. The one often periſhes for want of nouriſhment, occaſioned by ſome defect in the nerves or the arteries that ſupply it with blood; the other by being too much expoſed to accidents, and by having too great ſupplies of nouriſhment.

That eye is almoſt always weak which is of a longiſh oval figure, eſpecially where the two corners are narrow, like the ſhape of an almond. When the coat or membrane, that riſes from the under part of the eye happens to be large and thick, ſo as to preſs the eye-ball, and the caruncle or kernel on the inward corner next the noſe is ſpongy and moiſt, though there is ſometimes a remedy for this defect, yet ſuch horſes in the end generally go blind.

When the eyes are bad, the muſcles or movers of the eyes are generally weak; ſo if the eye looks dead and lifeleſs, the beſt way of trial is to hold up the horſe's head in the ſame manner as when a drench is to be given, which will draw the eye upward; and if it remains there fixed and immoveable, or has a languid motion, it is a pretty ſure ſign the eye is bad. And this trial will, for the moſt part, hold good whether the eye be moiſt or dry.

Some regard the colour of the eye, which, however, is different according to the difference of colour in horſes; and indeed we are ſo far to regard the colour, that if the iris or circle that ſurrounds the pupil or ſight of the eye be diſtinct, and of a pale variegated cinnamon colour, it always denotes a good eye. For the iris is always moſt diſtinct, where the humours of the eyes are moſt clear and pellucid; and thoſe horſes have the beſt eyes, which in colour reſemble the eyes of a ſheep or goat; but few horſes arrive to that perfection of colour and tranſparency, till they are at leaſt ſix years old or upwards. On the other hand, if the iris or circle round the pupil be of a dark muddy colour, and does not appear diſtinct and variegated, till one approaches near the eye, and if the narrow ſky-coloured verge, which we obſerve more or leſs in moſt horſes on the outſide of the iris, happens to be of a milky hue, it is of no good ſign. Nevertheleſs, wall-eyed horſes have for the moſt part good eyes.

Some in examining the eyes have a regard to the colour of the horſe, which I take to be no ſure way of judging; for as there are good horſes of all colours, ſo there are good eyed horſes of all colours. The grey, eſpecially the pigeon or dove-coloured grey, are the moſt ſuſpected; alſo the iron-grey, and the dun, &c. But I think I may ſay from experience, that whatever colour is the moſt common among the horſes, ſo as to exceed in number, abounds moſt with bad eyes: and I have obſerved as many bad eyed horſes among the black coach breed as any other.

Moſt people in examining a horſe's eyes lead him under a gate-way, or ſome ſhade, that they may ſee perfectly the colour and tranſparency of the eye: but the beſt way is to obſerve his countenance when he comes firſt out of a dark ſtable into a ſtrong light; for if he has any weakneſs in his eyes, he will wrinkle his brow, and look upwards to receive more light; and if the pupil at the ſame time be large, it is a bad ſign; and therefore the beſt way is to look to a horſe's eyes firſt in the ſhade, to obſerve the dimenſions of the pupil, and if that leſſens upon his coming out into a ſtrong light, it is almoſt an infallible ſign that the eye is good.

Some ſuſpect all horſes that ſtartle to have bad eyes; indeed many bad eyed horſes are apt to ſtartle: but a horſe that ſtarts and looks upwards, lifting his feet high when he moves, as if afraid to touch the ground, ſuch is more likely to have bad eyes than one that ſtartles; for many horſes ſtartle merely out of fear, and I imagine not a few from ſome defect in viſion, viz. from ſeeing objects indiſtinctly at ſome diſtance, in all which caſes the eyes may be ſtrong and durable, though many fancy them to be weak. But if a horſe frequently ſtartles when no object is before him that might cauſe him to ſtartle, we may then ſuſpect his eyes to be but indifferent.

Upon the whole, that eye is generally good where the eye-lids are thin, where the outward coat or tunicle of the eye is alſo thin and delicate, where the caruncle next the noſe is ſmall and dry, where the eye is tranſparent and ſprightly, when a horſe has a bold reſolute look, and takes notice of objects without fear. On the other hand, when a horſe moves his ears backwards and forwards, and ſeems ſurpriſed at every noiſe or motion of the hand; when he raiſes his feet high, is uncertain in his walk or ſtep, and unequal in his goings, when his eyes appear full and ſwoln with a fleſhy circle round them, or when they are ſunk or flat, or of a longiſh oval figure, when the outer coat is thick and covers a great part of the eye-ball, and the glands or kernels of the eye are ſpongy and moiſt,

all

all these denote the badness of the eyes, and are often the forerunners of blindness. *Gibson's Farriery, vol.* I. *page* 14.

EYE *of a tree*, a small pointed knot to which the leaves adhere, and from which the shoots or sprigs spring forth.

EYE, among gardeners, implies the small bud or shoot inserted into a tree.

EYE-LID, the membrane that covers the eye.

If the eye-lid of a horse is wounded and cut through, and the cut divides it so as the lips part one from the other, it ought to have a stitch with a strait needle, such as the surgeons use for superficial wounds, and not to be drawn too close, but just so far as to bring the edges together; and this is yet the more necessary when the eye-ball happens to be wounded through the eye-lid, that there may be room for the discharge of the matter. I have observed that the eye-lid requires but one stitch, for when there are more, and these pursed together, as the farriers generally do, and the lips drawn close, such stitches will break in twenty-four hours, and leave the wound in a worse condition than it was at first.

The proper dressing for wounds of the eye, is honey of roses, and tincture of myrrh, viz. one dram of the tincture to an ounce of the other. The best way of using it is to dip a pledgit of lint in this mixture, made warm, and applied to the wound, for tow and hurds are too harsh for the eye. This dressing may be repeated once a day, until the wound is healed up and cicatrised, and it will seldom fail of success. *Gibson's Farriery, vol.* I. *page* 320.

F.

FALLOW, land ploughed, but not sown, being left to rest after the years of tillage.

If the farmer finds that one summer's fallow does not entirely answer the purpose of dividing and loosening the earth, it is his interest to continue it for another. M. Tull confirms this, by instancing a poor man, whom necessity compelled to take this method, because he could not get seed for his ground after he had tilled it the first year. The consequence was, that his crop was worth more than the value of the land it grew on. Mr. Maxwell too mentions another, who, from a like necessity, followed the same course upon almost his whole farm, had such a crop as enabled him to pay many debts, and, by continuing the same practice, came in few years to be in a condition to purchase the farm.

When the husbandman intends to break up any piece of land, the first thing necessary is carefully and judiciously to examine the surface of the ground, and its depth. If the surface be covered with a thick, strong, fibrous turf, and the mould underneath sufficiently deep, his best, and indeed the only right method of proceeding, is excellently well directed by the marquis of Turbilly. But if, on the contrary, the upper mould should be shallow, or so thin turfed as not to be fit for burning, he must observe, whether his soil be of a strong, or of a light quality. Under the former of these are included all deep hard clays, of what colour soever; all stiff binding earths, and such as, after being exposed to the sun, or frost, grow hard and stony; with such as chop and cleave upon their surface in the heat of summer: and under the latter are ranked (the repetition may be excusable here for the sake of perspicuity) all sandy, mouldering, gravelly, mellow soils; all loose and open earth, of what nature soever; all such as are not sticky, but will soon dry after rain; and, instead of lying in great lumps after ploughing, are easily apt to dissolve, and crumble into mould, not being subject to bind by the heats in summer, or frosts in winter.

If, upon examination, the soil is found to be of the stiff kind, particular care must be taken to turn down its surface in the latter end of autumn, that what fibrous roots there are in it may be the more effectually rotted against the summer ploughing, and that the earth may be mouldered, or mellowed, by the winter's frost and rains.

When ploughed land is intended to be fallowed, it should likewise be ploughed in the autumn, as soon as the seed time permits, and laid as rough as may be, especially if it be a stiff soil, that the winter's frost may mellow it.

In the spring, the farmer should take the earliest opportunity that his spring crops will admit of, to give his fallows a second ploughing across the former; after which the ground should be well harrowed, not only to break the clods, but to pull up such roots as are not yet rotted, that they may be gathered into heaps and burnt. It is essentially necessary that this, and all the following ploughings and harrowings be performed in dry weather; because, as the purpose here is thoroughly to loosen the mould, special care should be taken to avoid every thing which might counter-act that intention. The farmer cannot wish for a greater benefit to his husbandry, than moderate showers after each fallow, to bring the seeds of every weed to vegetate, in order that, being turned down by the several ploughing, they may be the more effectually destroyed.

It seems needless to mention when the future ploughings should be given, because the farmer should take every opportunity of repeating both them and the harrowings, in full confidence that he cannot over-do it, especially in strong soils; in which he may also be equally certain, that he cannot err in ploughing too deep: for it is of great consequence, not only that the roots have a sufficient depth of mould to penetrate in, but also that the cold clay be removed to as great a distance as possible from the surface; because, by its retaining the water, the roots of plants are chilled and killed, efpecially in the winter, when they reach fuch ftagnating wet. If any manure is applied to alter the quality of the foil, it cannot be laid on too early in the fummer, that the ploughings may the more effectually mix it with the earth; but if only compoft be ufed for enriching the foil, it need not be fpread till juft before the laft ploughing.

Authors give directions for ploughing land into many different forms, moftly arifing from the different natures of foils, but too often from the particular long eftablifhed cuftom of countries, the reafonablenefs of which is not always fufficiently confidered.

Where there is a defcent for water, all lands fhould be laid flat, becaufe, in that way, the rains will undoubtedly give a more equal nourifhment to the crop, than when they are raifed in ridges. The practice of laying light foils into narrow ridges, for wheat, is certainly owing to want of attention; and even in ftrong land ploughed for winter fallowing and fowing, we are much inclined to think that the beft way would be, inftead of fingle bouts, or narrow ridges, to make the ridges very broad, and lay them up high: for if the ground is level, the water will lie in the parting thoroughs, and, by foaking into the fides of the ridges, make it fo poachy, as to render it very unfit to be worked, till late in the fpring, unlefs the feafon be very dry; or, if there is much defcent, great part of the beft foil will be carried off. For the fame reafons the fides of hills fhould always be ploughed almoft, but not quite, horizontally, that the parting thoroughs, lying open, may ferve for drains to the water: befides which, the ploughing of fuch declivities in this floping manner is by much the leaft laborious both to men and cattle. The furrow here fhould always be drawn oblique, as Columella directs, fometimes a little toward the higher, and and fometimes toward the lower part of the hill, fo that the direction may be altered in each fubfequent ploughing.

The erroneous opinion of thofe who imagine that the furface of the ground is confiderably enlarged by ploughing it into high ridges, and that it therefore affords a larger fpace for the growth of plants, is thus judicioufly refuted by M. Duhamel.

" The produce of a floping furface is not greater than that of a plane equal in extent to the bafe of the flope: for as the plants grow perpendicular to the horizontal bafe, there is no point of the flope which does not anfwer vertically to a point of that horizontal bafe: therefore, fuppofing the furrows of a piece of ground ploughed in broad lands to be fix inches deep, and the ridges fix feet wide; the flope from the bottom of the furrow to the middle of each ridge will be one foot in fix, which is indeed confiderable: but ftill the furface of the ridges will be to that of their horizontal bafe, only as feventy-fix are to feventy-five: a fmall advantage; efpecially when compared to a fixth part of the ground, which is taken up by the furrows, and in which no corn is fowed."

Another, and that very effential, advantage of fallowing, not yet fufficiently infifted on, is the deftruction of weeds, which are one of the farmer's greateft enemies. By weeds, we here mean every plant which grows fpontaneoufly in the field, without having been purpofely fown, and which it is not the hufbandman's intention to cultivate. All thefe fhould be rooted out. It would be needlefs to enumerate them after this general definition; and perhaps equally fo to obferve, what every hufbandman muft know, that cockle, darnel, fox-tail, wild poppies, wild vetches, wild oats, dog's grafs, colt's foot, melilot, knot-grafs, thiftles, and charlock, are the moft hurtful fpecies of thefe noxious growths, and the moft difficult thoroughly to extirpate.

To prevent the increafe of weeds, they fhould be deftroyed before their feed is ripe: but that is not poffible in lands which are ploughed in the common way; becaufe, as they grow intermixed with the corn, and ripen fooner than wheat, their feeds fow themfelves: neither can they be extirpated by refting the land; for the feeds of fome of them will remain found feveral years in the earth. If a field in which there are many poppies, or red-weeds, as they are called in fome places, be fowed with faintfoin, fcarce a poppy will appear the fecond year: but when the faintfoin is ploughed up, even at the end of nine years, the red-weed frequently appears a-new, which can hardly be owing to any other caufe, than that its feeds have remained found in the earth during all that time; for very few of them, in proportion to the quantities which fpring up, can have been brought from the neighbouring grounds, or in dung. This is confirmed by an experiment which M. Duhamel made. He ordered the earth, with which a ditch had been filled fifteen or twenty years before, to be dug out, and fpread upon a piece of ploughed land. Several plants, of different kinds from any that were in the field, fprouted up in the place where this earth was laid. Confequently they were produced by feeds which had remained found in the ground, during the fifteen or twenty years that this earth had lain in the ditch.

This is an important reafon for ploughing thoroughly all lands which are fallowed: for it is certain, that as numbers of feeds fhoot up during the fallow, repeated ploughing will deftroy many of them. But there are feveral kinds of plants, fuch, in particular, as wild oats, and fox-tail, the feeds of which do not fprout till they have remained two or three years in the earth; nor will culture make them grow fooner. Such, at leaft, is M. Duhamel's opinion, as well as that of feveral other very ingenious gentlemen, though it muft be confeffed, that fome late experiments feem to contradict it, and to fhew, that the feeds of thofe plants which he fays require being three years in the ground before they will grow, were only buried fo deep, in the cafe he mentions, as not to be able to vegetate, which they afterwards did when laid within reach of the influences of the air, rain, dew, &c. If fo, though the increafe of weeds may be prevented for feveral years, by ploughing, cutting, pulling them up, &c. yet it is evident, that the repeated ploughing of fallow lands, far from immediately deftroying thefe kinds of weeds, will rather help them to grow, when their feeds are brought within a proper diftance from the furface, and their time of fprouting is come. But then, allowing that fome of their feeds may be thus brought up by each ploughing, for a while, it cannot be long before all of them will have fprouted, after which the ground may be kept quite clear, with proper care.

Hufbandmen have not yet found a more effectual method to deftroy weeds, than by fowing the ground out of feafon; that is to fay, by fowing oats the year that barley fhould be fowed. It has been experienced, that, by this means, fome kinds of weeds have been deftroyed, which, appearing only every third year, never fhews themfelves, in the ufual rotations, but amongft wheat. But the farmer loofes a crop by this means, and ftill has fo many weeds left, that he is obliged to hire people to weed his corn. This is done two ways.

A number of women place themfelves in a row, and, with a hoe made for the purpofe, cut up all the weeds they fee, fuch as thiftles, blue-bottles, poppies, &c. But many of thefe, when young, frequently efcape their notice; in which cafe the hoeing muft be repeated when they are grown larger; and the fmaller weeds, fuch as wild vetches, wild oats, darnel, knot grafs, fox-tail, young poppies, &c. which are at leaft as hurtful as the other, remain in the field. Befides this, in cutting the weeds, it is fcarce poffible not to cut down fome of the corn; and the roots of the thiftles and other biennial plants which are cut, produce two or three new ftalks in lieu of the old one; by which means the evil is increafed.

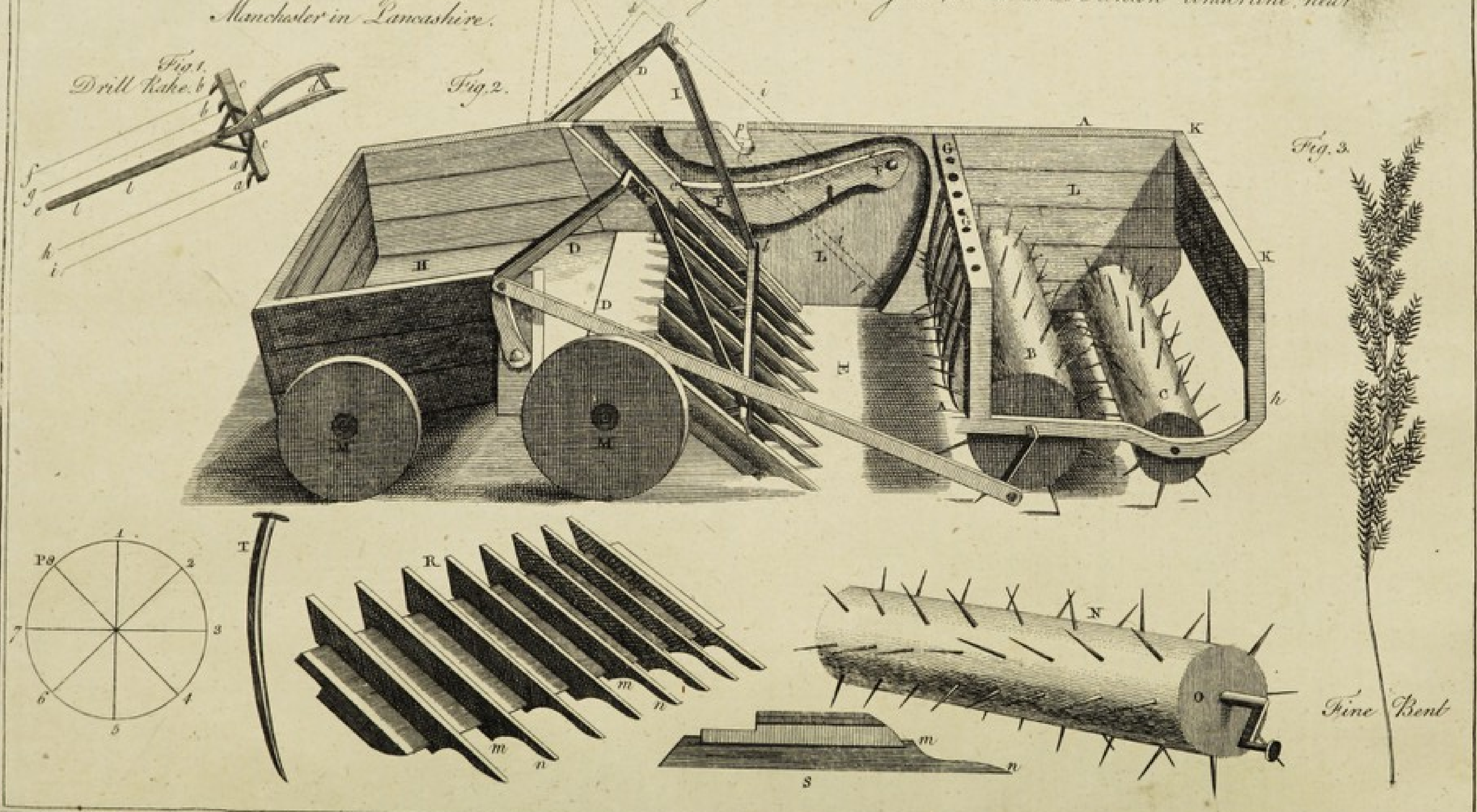
The other method of clearing corn, is by hand-weeding it; but this is feldom practifed by farmers, becaufe it is too expenfive: and indeed the women and children generally employed to do this work, moft commonly pull up a great deal of corn with the weeds; fo that, what with that, and with their trampling, and dragging their bags of weeds over it, they frequently do more hurt than good, efpecially if the earth be moift.

The fureft way to deftroy weeds, is to continue ploughing while the corn grows: but this can be done only in the new hufbandry.

Weeds may be ranked under four general claffes: firft, fuch as have creeping perennial roots: fecondly, fuch as grow in cold wet foils: thirdly, fuch as are of a large fucculent body; and, fourthly, fuch as having fmall feeds, or feeds which ripen before the corn, fow themfelves. Each of thefe require a different treatment.

The

A Fallow-cleaning Machine, Invented by Mr. Aaron Ogden, a Smith at Ashton Underline, near Manchester in Lancashire.



The first sort cannot be destroyed but by repeated summer fallows, by which their roots are cut, and turned up to be withered by the sun and winds, after which they are dragged out by harrows, and should be burnt. This, repeated as often as the farmer conveniently can, especially during a dry season, can scarcely fail to have the desired effect. Colts-foot, which is propagated by the root, and is a very pernicious weed, may likewise be destroyed by sowing the ground with rye-grass, or any plant which, coming up early in the spring, shades and smothers it; for that will kill it in a few years. The second kind are destroyed by draining the earth of its superfluous moisture, and by manuring it with lime, ashes, gravel, shelly sea-land, and other proper correctives for such soils.

The third are extirpated by cutting them down when in full sap and vigour: for the sap being thereby suddenly interrupted in the course of its circulation, stagnates in the roots, and putrifies there. A few weak lateral shoots may be made; but if they are likewise cut in the same manner, the roots will putrify intirely by degrees, and, instead of annoying, will become a manure.

The fourth class can be destroyed only by frequent fallows, and constant cutting, or rather ploughing them down before they run to seed. Some, for instance the wild oats, may be mowed for hay: but it is much more beneficial to the land to plough them in: because, by that means, instead of being exhausted by frequent crops, it is manured by those enemies to useful grain.

FALLOW, also signifies a pale red colour.

FALLOW-CLEANSING *Machine*, an instrument invented by Mr. Aaron Ogden, a smith at Ashton-under-Line, near Manchester, in Lancashire.

This machine, which bids fair to be of very great use in husbandry for cleaning fallows from weeds, &c. which waste the riches of the soil, will be very easily understood from the drawing we have given of it on Plate XV. Fig. 2. Where,

A, A, is the frame; B, the first roller; C, the second ditto, in which last are two cranks to move the arms D, D, which work the rake up the directors fixed on the plank E. The under side of the lower ends, or shares, of these directors, are sharp to cut the clods, and let them come on the upper side. Each alternate heel of the share is longer than the intermediate one, that they may not have more than one half to cut at once.

At the back of the plank E, are two screws to let it loose, that the directors may be set higher or lower. The shares are to penetrate the ground two or three inches, to raise the quicks till the rake I, I, fetches them into the cart H, where a man must be ready with a muck-hook to clear them backward when gathered.

In the rake I, are two teeth for every space of the directors, that stones, &c. may be gathered without damage.

K, K, are two staples, by which the machine is drawn: under them, at *h*, are two hooks, placed low to raise the machine in turning, by the help of the traces; and the axle-tree of the cart should be fixed upon a pin, that it may turn like a waggon.

F, F, are the triggers to throw the rake behind the roots. The long teeth at G, G, are to cleanse the roller C.

I, I, is the rake which gathers up the weeds into the cart H, and is drawn above the trigger F, by the working of the arms D, expressed by the dotted lines at *d d*, *i i i*.

The triggers F, of which there is one on each side, move on the pivots *a*; so that when the points *b*, of the rake I, having been drawn up by the directors E, to the part marked *c*, the trigger, giving way, permits the rake to pass; but immediately falling, the rake returns along the upper surface of the trigger marked *e*, *e*, and of course falls on the weeds when it comes to the end, a little beyond the pivot *a*.

The reader will observe that the boarding is taken away on one side, in the plate, in order to give a more perfect view of the inner parts of the machine; and, in fact, it would, perhaps, be better if all the boarding, marked L, L, L, was taken away, and frame-work put in its stead.

The cart H, might undoubtedly also be made lighter.

The wheels M, M, appear, in the plate, to be made of solid wood; but there is no necessity they should be so.

At N, is another view of the roller C, by which the disposition of the spikes may be easily comprehended.

Suppose the circle O, described by the end of the roller N, to be divided by four strait lines into eight equal segments, as represented at P. Let the same be done at the other end of the roller, and parallel lines be drawn from one corresponding point to the other, the length of the roller: mark the points with figures 1, 2, 3, 4, 5, 6, 7, 8; afterwards draw oblique lines, as from 1, at the end O, to 2, at the other end, and from 2 to 3, &c. on these oblique lines the spikes are to be fixed, at equal distances, in eight circles, described on the circumference of the roller.

The spikes of the small roller B, are fixed in the same manner, except that, the diameter being smaller, there are only six instead of eight rows.

R, is another view of the directors, with the plank E, on which they are fixed; and at S, is a section of a part of the plank, with one of the directors as fixed, in which may be seen the heel *m*, from whence, to the point of the share *n*, is a sharp, cutting edge. See the same letters in figure R.

At T, is one of the long teeth to be seen at G: it is bent towards the roller C, which it serves to cleanse. When the end of the rake *b*, after rising above *c*, is pushed, by the motion of the arms D, D, along the upper part *e*, *e*, of the trigger F, and comes to the end beyond *a*; as it falls, the part of the arm, marked *o*, rests in the notch *p*, till it is again raised by the motion of the roller C, with the rake.

The roller C, is to be one foot diameter, the spikes nine inches long, that they may go through the furrow (if the soil should be too loose) into the hard earth, the more effectually to work the rake, which otherwise might be so over-charged as to cause the roller to drag without turning.

In the rake-ends *b*, there should be pivots, with rollers or pullies on, to go in the groove, to take off the friction; and they would likewise take the triggers more surely as the rake comes back.

The rake should also be hung so far backwarder, that when it is fallen, the arms of it may lie in the same plane, or parallel, with the directors, on which it comes up (which will require the frame to be two inches longer in the model.) This will cause the rake to fall heavier, and drive the teeth into the roots, and bring them up without shattering. These teeth must be made of steel, very fine, and so long as to reach down to the plank on which the directors are fixed, that is to say, six inches long (the directors are to be also made six inches broad above the plank.) The rake-head should also fall a little before the crank is at the extremity, which will cause the rake to push forward to let the teeth come into the roots. The rake-teeth must drop in the same plane with the roller and wheels, or on the surface of the earth. No more space should be given from the roller C, to the long teeth, at G, G, than that the rake may just miss the spikes of the roller C, and fall on the places before mentioned.

As the first roller B, was intended to cleanse the second C, more than any other use, it may be omitted when the machine is made in large, as Mr. Ogden has lately found that the long teeth at G, G, answer the end alone, and this renders the machine about a sixth part shorter.

Now, to suit any sort of earth, there should be to each machine three planks, with directors at different spaces, to use occasionally: in the first, the spaces between the directors should be eight inches wide, in the second six, and the third four. This will answer the same end as having so many machines.

As there may be some objections to the rake not leaving the roots when it has brought them up, Mr. Ogden has several methods for cleansing it; but as he would make it as simple as possible, he chuses to let it be without them at present: but suppose it should bring some roots back again with it, it will probably lose them before it gets back to the extremity; whence they will lie light, and be of but little detriment to the others coming up.

Mr. Ogden would have the first machine made four feet six inches wide, the teeth divided into equal spaces, the outsides into half spaces.

FAN, an inftrument for winnowing corn. *See the article* WINNOWING.

FANTOME CORN, thin, or light corn, that which has but little bulk or folidity.

FARCY, or *Farcin*, a diftemper to which horfes are too often fubject. It is a difeafe of the blood veffels, generally following the courfe of the veins, and, when inveterate, thickens their coat and integuments.

At firft one or more fmall fwellings, or round buds like grapes or berries, fpring out over the veins, and are often exquifitely painful to the touch; in the beginning they are hard, but foon turn into foft blifters, which, when broke, difcharge an oily or bloody ichor, and turns into very foul and ill-difpofed ulcers. In fome horfes it appears on the head only; in fome on the external jugular; in others on the plate-vein, and runs downwards on the infide of the fore-arm towards the knee, and very often upwards towards the brifket; in fome the farcy fhews itfelf on the hind parts, about the pafterns, and along the large veins on the infide of the thigh, rifing upwards into the groin, and towards the fheath; and fometimes the farcy makes its appearance on the flanks, and fpreads by degrees towards the lower belly, where it often becomes very troublefome.

When the farcy appears on the head only, it is eafily cured, efpecially when it is feated in the cheeks and forehead, the blood-veffels being here fmall; but it is more difficult when it affects the lips, the noftrils, the eyes, and kernels under the jaws, and other foft and loofe parts, efpecially if the neck-vein becomes chorded. When it begins on the outfide of the fhoulder or hips, the cure is feldom difficult; but when the farcy arifes on the plate-vein, and that vein fwells much, and turns chorded, and the glands or kernels under the armpits are affected, it is hard to cure; but more fo when the crural veins within-fide of the thigh are chorded, and befet with buds, which affect the kernels of the groin, and the cavernous body of the yard. When the farcy begins on the pafterns or lower limbs, it often becomes very uncertain, unlefs a timely ftop is put to it; for the fwelling in thofe dependant parts grows fo exceffively large in fome conftitutions, and the limbs fo much disfigured thereby with foul fores and callous ulcerations, that fuch a horfe is feldom fit for any thing afterwards, but the meaneft drudgery: but it is always a promifing fign, wherever the farcy happens to be fituated, if it fpreads no farther. It is ufual to affect only one fide at a time, but when it paffes over to the other, it fhews great malignancy; when it arifes on the fpines, it is then for the moft part dangerous, and is always more fo to horfes that are fat and full of blood, than to thofe that are in more moderate cafe. When the farcy is epidemical, as fometimes happens, it rifes on feveral parts of the body at once, forms nafty foul ulcers, and makes a profufe running of greenifh bloody matter from both noftrils; and foon ends in a miferable rot.

From this defcription of the farcy, it will appear how greatly thofe may be difappointed, who depend on fome fingle fpecific drink or ball for a certain cure; for the fymptoms are fometimes fo favourable, that it is eafily conquered by a very fimple management; and when it arifes fuperficially upon the fmaller veffels, it will often go off, with moderate labour, without any other means than bleeding. Such inftances as thefe may eafily give a reputation to things of no great efficacy, and bring them into efteem: but whoever has acquired any true notion of the farcy, will know that this diftemper is not to be conquered but by fuch things as are fitly adapted to the various fymptoms that occur in the different ftages of it. To avoid therefore the perplexity that arifes from the various complications fo ufual in the farcy, we fhall confider it in its different ftates, or degrees, viz. when it feizes only the fmaller veffels; when the larger veins are chorded, and the feet, pafterns, and flanks affected; and laftly, when the farcy, beginning on one fide only, breaks out on the other alfo, and affects the whole body.

When the farcy makes its firft appearance on the head, it rifes on the cheeks and temples, and looks like a net-work, or fmall creeping twigs full of berries. Sometimes it inflames the eye, and fometimes little blifters or buds run along the fide of the nofe. It arifes often on the outfide of the fhoulder, running along the fmall veins with heat and inflammation; and fometimes a few fmall buds appear near the withers, and on the outfide of the hip. In all thefe appearances, the difeafe being fuperficial, and affecting only the fmaller veffels, is eafily conquered by the following method, when taken in time; for the fimpleft farcy, if neglected, may degenerate into the worft fort.

This diftemper then being of an inflammatory nature, and in a particular manner affecting the blood veffels, muft neceffarily require large bleeding, particularly where the horfe happens to be fat and full of blood. This always checks the beginning of a farcy, but is of fmall fervice afterwards; and if a horfe is low in flefh, the lofs of too much blood fometimes proves injurious. After bleeding, let the horfe have four ounces of cream of tartar and lenitive electuary; which may be given every other day for a week, to cool the blood, and open the body; and then give nitre three ounces a day, for three weeks or a month; and anoint the buds and fwellings with the following ointment twice a day.

" Take ointment of elder four ounces, oil of turpentine two ounces, fugar of lead half an ounce, white vitriol powdered two drams; mix together in a gally-pot."

The buds fometimes by this method are difperfed, leaving only little bald fpots, which the hair foon covers again. When they break and run, if the matter be thick and well digefted, they will foon be well: but in order to confirm the cure, and to difperfe fome little lumps, which often remain for fome time on the fkin without hair, give the liver of antimony for a month; two ounces a day for a fortnight, and then one a day for the other fortnight; by following this method, a farcy which affects only the fmall veffels, may be ftopped in a week or ten days, and foon after totally eradicated.

When the farcin affects the larger blood veffels, the cure is more difficult; but let it always be attempted early; therefore, on the plate, thigh, or neck-veins appearing chorded, bleed immediately on the oppofite fide, and apply the following to the chorded vein.

" Take oil of turpentine in a pint bottle fix ounces, oil of vitriol three ounces; drop the oil of vitriol into the oil of turpentine by a little at a time, otherwife the bottle will burft; when it has done fmoaking, drop in more oil of vitriol, and fo on till all is mixed."

This mixture is one of the beft univerfals in a beginning farcy; but where it is feated in loofe flefhy parts, as flanks or belly, equal parts of the oil of vitriol and turpentine are neceffary.

Rub the parts firft with a woollen cloth; and then apply fome of the mixture over the buds, and wherever there is any fwelling, twice a day. Give the cooling phyfick every other day, and then three ounces of nitre every day for fome time. This method muft be continued till the buds digeft, and the chord diffolves; and when the fores run plentifully, the matter digefts well, and the lips and edges are no ways thick or callous, you may expect a fpeedy recovery; yet to confirm the cure, and prevent a relapfe, give the liver of antimony or crude antimony, as before directed; and to heal the fores and fmooth the fkin, drefs with bees-wax and oil.

When the farcy begins on the flanks, or towards the lower belly, it often takes its rife from a fingle puncture of a fharp fpur. The pain and fmarting is one fure fign to diftinguifh the farcy from common accidents: the ftaring of the hair, which ftands up like a tuft all round the buds or blifters, and the matter that iffues from the buds, which is always purulent, and of a clammy greafy confiftence, are other certain figns. After bathing with the mixture above-mentioned till the ulcers are fmooth and healing, fhould the fwelling not fubfide, to prevent the fpreading of the buds, and to difperfe them, bathe with either of thefe mixtures as far as the center of the belly; and at the fame time give a courfe of antimonials, as will prefently be prefcribed.

" Take fpirits of wine four ounces, oil of vitriol and turpentine of each two ounces, white wine vinegar or verjuice, fix ounces."

Or the following:

"Take fpirits of wine rectified four ounces, camphor half an ounce, vinegar or verjuice fix ounces, white vitriol, diffolved in four ounces of fpring water, one ounce; mixed together."

In the lower limbs the farcy lies fometimes concealed for a great while, and makes fo flow a progrefs, that it is often miftaken for greafe, or for a blow or kick; and goes by the general appellation of a humour fettled there. In order to diftinguifh the one from the other, we fhall obferve that a kick, or bruife, is generally attended with a fudden fwelling, or a contufed wound, which for the moft part digefts eafily; the greafe is alfo a fmooth fwelling that breaks out above the bending of the pafterns backwards; but the farcy begins on the paftern-joint ufually with one bud, and runs upwards like a knotty crab-tree.

Very fimple means has fometimes ftopped it, before it has began to fpread; a poultice with bran and verjuice bound round the part, and renewed once a day, will often alone fucceed; and if proud flefh fhould arife, touch it with oil of vitriol, or aqua-fortis, an hour before you apply the poultice; for when the diftemper is local, as we fuppofe it here, it is to be conquered by outward applications.

When the diftemper grows inveterate, and refifts the above method, and the veffels continue chorded, Gibfon recommends the following mixture:

"Take linfeed oil half a pint; oil of turpentine and nitre, of each three ounces; tincture of euphorbium and hellebore, of each two drams; the foldiers ointment, two ounces, or oil of bays; oil of origanum, half an ounce; double aqua-fortis, half an ounce. After the ebullition is over, add two ounces of Barbadoes tar."

Rub this into the chorded veins, and wherever there is a fwelling, once in two or three days; but if the orifices are choaked up with proud flefh, or the fkin fo much thickened over the ulcers as to confine the matter, in either cafe it is neceffary to make an open paffage with a fmall hot iron, and deftroy the proud flefh, after which it may be kept down by touching with oil of vitriol, aqua-fortis, or butter of antimony. A falve may alfo be prepared with quickfilver and aqua-fortis, rubbing any quantity of the former with enough of the latter, to the confiftence of a liniment; fmear the ulcers with this whenever they appear foul, and you will find it preferable to moft other eating ingredients.

Our farriers after opening the buds, put in ufually a fmall quantity of corrofive fublimate or arfenic, which they call coring out the farcy; this may anfwer where the buds are few, and not fituated near large blood veffels, joints, or tendons: others ufe Roman vitriol, or fublimate and vitriol, in equal quantities: but let it be remembered, that many a horfe has been poifoned by thefe medicines ignorantly ufed, and in too large quantities; which fhould be a caution to huntfmen not to fuffer their hounds to feed on the carcafes of farcied horfes, as the greateft part of a pack have been poifoned by that means.

I fhall now mention fome of the defperate methods, and more violent kinds of medicines given by fome internally: thus, from four to eight ounces of lapis caliminaris, to which two ounces of tutty, finely powdered, is added, with other metallic fubftances have been given. Some give a pound of barrel foap boiled in ftale beer; with favin, rue, and other herbs of that intention: others go yet further, being determined to kill or cure, by giving drinks prepared with green vitriol, roche-allum, Roman vitriol, oil of vitriol, boiled in chamber-lie, with hemp-feed, hemlock, and common falt. Thofe who ufe nothing but the decoctions or juices of herbs, fuch as wormwood, rue, or elder particularly, ftand a much better chance for a cure, if given in time; but when the diftemper is grown inveterate, nothing comes in competition with mercurial and antimonial medicines.

The following balls are proper in every ftate of the farcy; and when the diftemper has been in its infancy, before the fkin was much defaced, has often cured it in a week or two, by giving them only once or twice a day: but in an old farcy, they fhould be given for two or three months together.

"Take of native cinnabar, or cinnabar of antimony, eight ounces; long birthwort, and gum-guaiacum powdered, of each four ounces: make into a pafte with honey, and form into balls of the fize of a large walnut, and roll them into liquorice powder."

The tedioufnefs of this courfe has encouraged the giving of mercurials, and indeed, where they are directed with fkill, they muft be attended with fuccefs; the ftronger preparations, as the red and white precipitates, and turbith, being combined with fharp faline parts, may be hazardous and injurious, but the latter given in fmall quantities have been found very fuccefsful in fuch kind of inveterate diforders. Mr Gibfon fays, he has given it to a dram at a dofe, where the limbs have been greatly fwelled; that in forty-eight hours the fores were all dried up, and the limbs reduced; but that it made the horfe fo violently fick for feveral days, and fcoured him to fuch a degree, that it could not be repeated.

One would have thought, that the fuccefs attending this medicine fo fuddenly might have encouraged Gibfon to have made further trials in fmaller quantities; which, had he done, it is more than probable, he would not have been difappointed: for the grand fecret in giving mercurials, as alteratives, is the introducing them into the blood, without operating on the ftomach and bowels; and to do this effectually, they muft be given in fmall quantities, and fo bridled, as to controul their force on the firft paffages: taken in this manner, they will mix gradually with the blood and juices, and operate both effectually and fafely.

The method I would recommend is as follows: give one fcruple, or half a dram of turbith, mixed into a ball, with an ounce of Venice foap, every other night for a fortnight; then abftain a week or ten days, and repeat it again. Should this ball purge, or make the horfe fick, mix it up with two drams of philonium, or with four or five grains of opium, or camphor; with thefe reftrictions, it may be given for fome weeks; but fhould the horfe's mouth be found tender or fore, you muft refrain giving, till that complaint is removed by gentle purges; and then return to it again in fmall quantities; for as the effects of mercurials are very different in the different conftitutions, both of horfes, as well as men, fo the quantity muft be varied in proportion to the operation, which is not intended here to be fenfible, but to work imperceptible on the blood and juices, correcting them as a powerful alterative. During the whole courfe, particular care fhould be taken that he gets no cold.

Two ounces of quickfilver, divided with an ounce of turpentine, and made up into four balls, with diapente, and gum guaiacum, of each two ounces, and a fufficient quantity of honey, have, for this purpofe, been fuccefsfully given, one ball twice a week; but gentle purgatives fhould be interpofed, to prevent a falivation, which fome horfes are very prone to, on taking mercurials, though in fmall quantities.

Dr. Brachen recommends the knots and chords to be rubbed with the mercurial ointment before they break, in order to difperfe them, and, after breaking, to drefs the fores with equal parts of Venice turpentine and quickfilver; if by thefe means the mouth fhould become fore, treat as above. This method feems to be effectual with proper care.

The following is alfo recommended by the fame gentleman.

"Take butter of antimony, and bezoar mineral, of each an ounce, beat up with half a pound of cordial ball, and give the bignefs of a walnut, or three quarters of an ounce every day, for two or three weeks, fafting two or three hours after it."

As moft preparations from antimony are of ufe in the farcy, fo from two drams of antihecticum poterii to half an ounce, may be given with a bit of cordial ball every other day, for fome time; for in thefe obftinate cafes the very crafis of the blood muft be altered, which can only be affected by degrees, and of courfe is a work of time. *Bartlet's Farriery*, p. 178.

WATER-FARCY. *See the article* WATER-FARCY.

FARDING-BAG, the firft ftomach of a cow, or any other ruminating animal.

FARE, *of pigs*, the number a fow bringeth at one time.

FARM, a portion of ground cultivated either by the owner or a tenant.

The ancient writers on hufbandry, who lived in warm countries, where the heat and moifture of the air had fenfible and frequently very dangerous effects on the health of the inhabitants, were very particular in their directions, for the choice of farms or eftates, and of the fpots whereon houfes fhould be built, fo as to avoid the inconveniencies arifing from the climate, or from the quality or fituation of the ground.

Though the temperate air which we enjoy in this ifland renders fuch directions lefs neceffary here, yet as feveral places in it are remarkably fickly, and as, even in the moft healthy fituations, many houfes and villages are built on the leaft healthy fpots, it muft be of confiderable advantage to thofe who can make their choice, to know what foils and places ought to be avoided; and of fuch as are already fixed, to be acquainted with the means of correcting thofe inconveniencies which cannot be totally remedied.

Inftructions of this kind are now full as neceffary in our language, as they ever were in the Greek or Latin, the countries in which Englifh is fpoken being more extenfive, and more various in their climes, than even the Roman empire ever was.

The facrifices of the ancient Romans fhew how attentive they were even in the choice of the ground they encamped upon: much more were they fo in that of the fituation and nature of the place where they laid the foundations of more lafting buildings. They examined the livers of the cattle fed on the fpot, when they offered them in facrifice; and if thefe were livid or corrupted, they offered others, as the unfoundnefs of the firft might be owing to fome cafual diftemper: but if they were often found to be morbid, they concluded that the air, water, or food which the place yielded, would have a like effect on human bodies, and therefore fpeedily left that ground, to fearch for a better fituation. If after repeated trials, they found the livers good, they judged the air and food to be fo likewife, and fettled accordingly. We may ftill obferve the good effect of this precaution, in the healthy fituations of the remains of Roman encampments: for they preferred health to every other confideration.

The Romans had pleafure, as well as profit, in view, when they bought or ftocked a farm; and therefore they laid it down as a rule, that no degree of fertility fhould tempt a man to purchafe in an unhealthy country, nor the pleafanteft fituation in a barren one. "Buy not too haftily," faid the wife Cato, "but view again and again the purchafe you intend to make; for if it be a good one, the oftener you fee it, the better it will pleafe you. Examine how the neighbouring inhabitants fare. Let the country it lies in be a good one; the ways to and from it good; and the air temperate. Let your land, if you can choofe your fituation, be at the foot of a hill, facing the fouth, in a healthy place, where a fufficiency of labourers, of cattle, and of water may be had. Let it be near a flourifhing town, the fea, or a navigable river; or bordering upon a good and well frequented road. Let the buildings upon your ground be ftrong and fubftantial. Do not rafhly condemn the methods of others. It is beft to purchafe from a good hufbandman, and a good improver."

Befides the healthfulnefs of the fituation, three other things fhould be particularly attended to in the choice of a farm or eftate; thefe are the air, the water, and the foil. The air fhould be pure, and temperate; the water wholfome, and eafily come at, and the foil rich.

The knowledge of the healthinefs of the air, is, as lord Bacon obferves, difcoverable rather by experiment, than by reafon or conjecture.

To examine the moifture of the air before a houfe is built, wool, or a fponge, may be hung up in the place, and afterwards compared with fome of the fame, expofed in the fame manner, and at the fame time, in another place. According as they gain more or lefs in weight, the air is more or lefs humid.

The air is liable to greater alterations, from heat and cold, in fome places than in others; and as that inequality in the air is an enemy to health, the moft equal fhould be chofen. This is eafily determined by the thermometer, and by viewing the fituation of the place; for the intermixture of hills and vaillies, though pleafing to the eye, may be held fufpected as to the lengthening of life, becaufe of the variations of heat and cold.

Open places and champaign countries are judged to be healthy, where the foil is dry, not parched or fandy, where wild thyme and other aromatic plants grow fpontaneoufly, and which is not otherwife bare, but interfperfed with trees for fhade. Yet the change of air in travelling, after being accuftomed to it, is healthy: whence many travellers have proved long lived; as, indeed, have alfo fuch as have dwelt conftantly in the fame cottage. A ruddy complexion, clear white of the eye, quick hearing, and diftinct voice, are fet down by Palladius, as marks of the healthfulnefs of the place where thefe circumftances are met with in the generality of its inhababitants.

The ancients were particularly attentive to the quality of their water, and to the eafe of coming at it. They advifed bringing into the farm-houfe the water of a fpring which never dries up; or, if there be no fuch fpring within the farm, to bring running water as near to it as may be; or to dig for well-water, not of a bitter or brackifh tafte. If neither of thefe was to be found, they directed large cifterns to be provided for men, and ponds for collecting and retaining rain water for cattle. They efteemed that running water to be beft for drinking, which had its fource in a hill: fpring, or well-water, from a rifing ground, was deemed the next beft: well-water in the bottom of a valley was held to be fufpicious; and marfhy or fenny water, which creeps flowly on, was by them rightly looked upon as the worft of all.

That water is known to be wholefome, which has no mineral in it, is perfectly clear, has no tafte or fmell, depofits no flimy fediment, leaves no fpots, or incruftation when boiled in copper or brafs veffels, and which boils pulfe in a very little time. "Rain water, fays Sir Thomas Elliot in his Caftle of Health, is the moft fubtile and pure of any other water. The next is that which iffueth out of a fpring facing the eaft, and paffeth fwiftly among great ftones and rocks. The third is of a clear river, which runneth on hard ftones and pebbles. There be divers means to try which is the beft water; for that which is lighteft in poife or weight, is beft; alfo that whereof cometh leaft fcum or froth when it doth boil; alfo that which will fooneft be hot. Moreover, dip linen cloths in fundry waters, and afterwards lay them to dry; and that which is fooneft dry, the water wherein it was dipped, is moft fubtile."

As fprings and well-water pafs through beds of fand, gravel, or fmall ftones, thefe clear it of all impurities, unlefs there be mixed with them fubftances which are foluble in water. If any mineral is mixed with the water, it is unfit for the farmer's ufe. If it be hard, it is thereby rendered unfit for wafhing, and fome other culinary ufes. This is the kind of water which gives flefh boiled in it a red colour. But even the hardeft water may be eafily rendered perfectly foft, and fit for any ufe, by mixing with it a fmall proportion of pot-afh, fixed falt, or, for want of thefe, the afhes of any burnt vegetables.

The animal and vegetable fubftances which are mixed with ftagnating water putrify, and taint that water. This taint is moft effectually carried off by boiling, during which all the putrid particles evaporate: and whatever elfe remains in it will fubfide when it is cold. It may likewife be much mended by having air forced through it by means of Dr. Hales's ventilator; or it may be corrected by mixing with it acids, fuch as vinegar, juice of four fruits, fpirit of nitre, vitriol, &c.

When there is neither running nor fpring water, artificial fprings may be made in the manner thus pointed out by Lord Bacon, who does not indeed fay that he had experienced it himfelf; but it has been repeatedly tried fince his time, and found to anfwer very well. "Upon a hanging ground, where there is a quick fall of rain-water, lay a half trough of ftone, of a good length, three or four feet deep in the ground, with one end upon the high ground, the other upon the low. Cover this trough with brakes, to a good thicknefs, caft fand upon the top of the brakes, and you will fee, after fome fhowers are paft, the lower end of the trough run like a fpring of water." This will continue for a long time after the rain is paft, "as if, fays that great philofopher,

lofopher, the water did multiply itfelf upon the air, by the help of the coldnefs and condenfation of the earth, and the confort of the firft water." A gentleman in France, whofe manfion ftood on a height far from any water, was advifed to make a long ditch, about a fathom deep, in the neighbouring higher grounds, and to fill it with fand; he did fo, and it continued to bring a plentiful fupply of water, for all domeftic purpofes.

M. de la Hire obferves, in the Memoirs of the Academy of Sciences for the year 1703, that rain-water which has been purified by paffing through clean fand, and is afterwards collected in fubterranean refervoirs, will keep a long while without becoming putrid. He thinks this water the beft that can be made ufe of, either for drinking, or for other economical purpofes, becaufe it is not impregnated with any mineral, as fpring waters fometimes are. The only thing requifite in the conftruction of fuch refervoirs or cifterns is, to have a place which will hold water, made of fuch materials as will not communicate any bad quality to the water, which is to remain there a confiderable time. The firft water that falls from the roofs of houfes, when it begins to rain, fhould be thrown away; as having ferved only to wafh the roof, which, in dry weather, is always covered with dung of birds, and other filth. He rejects fnow water for the fame reafon; and likewife the water of rain brought by winds which pafs over places infected with ill fmells, as large cities, finks, &c. He computes, that water enough for the ufe of any family runs off the roof of the houfe which is inhabited by that family.

The buildings on the farm fhould be proportioned to the produce, efpecially as to ftore-rooms. The expence of building fhould be fuch, as that, in cafe of accidents, one, or at moft, two years rent may repair them. The farm-houfe fhould be fomewhat elegant, to give pleafure to its poffeffors, and, as Columella adds, to allure the wife to take delight in it. It fhould be built on the moft healthy fpot of the farm, in a temperate air, fuch as the middle of a hill commonly enjoys, where it is neither ftifling in the fummer, nor expofed to the rage of winds and ftorms in the winter. It may be feated near a quick running river, if the banks are high, and the channel clear of mud: but if the river is large, care muft be taken to fituate it fo that the winds may carry off the vapours in fummer, and the fogs in winter, which otherwife would prove hurtful to the health of men and cattle. The front of the houfe fhould be turned from fuch a river. In a healthy fituation, a houfe fhould front the fouth-eaft, which is fhaded during the hotteft part of the day in fummer, and enjoys the morning fun in winter. A houfe facing wefterly will have the morning fogs longer retained, and will be too much heated by the afternoon fun. In an unhealthy fituation, the front fhould be turned toward the north.

In fouthern climates, where the fun is within a few degrees of being vertical in fummer, and yet the country is fubject to fevere cold in the winter, as is the cafe of fome of our North American colonies, a fouth front is rather convenient: for in the heat of fummer, the fun, being high, paffes over the roof from the eaft fide to the weft, and fhines but little, or not at all, in at the front windows, and very weakly, becaufe obliquely, upon the front wall. But in the winter, being low, it fhines full in at thefe windows, at a time when the cold renders its cheering prefence quite agreeable.

Places in this kingdom intended for defence, before the invention of cannon, were built either on rifing grounds difficult of accefs, or where they could eafily be fecured by moats filled with water. Villages and farm-houfes were moft frequently built in vallies, that they might be fheltered from ftormy winds; or near brooks or rivers, for the conveniency of water. In general, every means have not been ufed to provide againft the inconveniencies of thefe fituations: though as Mr. Worlidge obferves, "were we for the future but duly to obferve the beft fituations of places, and the compleateft methods of building, in fuch houfes as may hereafter be raifed, our England would in a few years appear a kingdom befet and adorned with curious and admirable habitations, poffeffed by noble and ingenious inhabitants."

Houfes built on too lofty a fituation are expofed to the violence of the winter's ftorms, and to the fcorching drought of the fummer: yet we too generally find them without the only fhelter their fituation admits of, which is wood. The reafon of this feems to be, that the inhabitants, finding that trees do not thrive well when they are firft planted on dry heights, are at once difcouraged. But where the plants are fenced from nipping winds while young, and protected from cattle till they become ftrong, fuch ground would be found abundantly favourable to the growth of trees which delight in a dry foil. "Thefe, as Mr. Worlidge expreffes it, would yield a cooling, refrefhing, fweet, and healthy air and fhade during the heat of fummer, and very much break the cold winds and tempefts from every quarter in winter."

One might be apt to think from the unhealthinefs of low and fenny countries, that moats full of water about houfes fhould be prejudicial to health: yet many facts fhew the contrary. In Numb. 310, of the Philofophical Tranfactions, a particular inftance is given of two parifhes which were furrounded with a morafs, and yet were very healthy. Many houfes furrounded with moats are drier than others in a feemingly better fituation; for books and furniture are often lefs apt to grow mouldy in the former, than in the latter. Hence it would feem probable, that the unhealthinefs of low marfhy countries muft arife, rather from the putrefaction of animals and vegetables in flow moving or ftagnating waters, than from a too great moifture of the air, occafioned by the quantity of water evaporated. Of this Dr. Pringle gives a remarkable inftance in his judicious and ufeful Treatife on the Difeafes of the Army, when he fays: "Another caufe of the moifture and corruption of the air were the inundations made about the fortified towns fince the commencement of the war; which were particularly noxious upon letting the water off in the beginning of the fummer, after the preliminary articles of the peace were figned. For thefe grounds, which were once entirely covered, being now half drained and marfhy, filled the air with moift and putrid exhalations. The ftates being made fenfible of this, by the ficknefs that raged at Breda, and the neighbouring villages, gave orders to let in the water again, and keep it penned up till winter."

All phyfical writers point out the great danger to which health is expofed from a moift and warm air; efpecially if it be attended with a putrid vapour. Too much care cannot therefore be taken to guard againft both. The too great moifture may probably be prevented by collecting all the wafte water into deep ditches or ponds. We frequently fee that ponds which have no fupply of water but from rain, retain water during a very dry fummer, when, according to the ufual calculations of evaporations, the whole muft have difappeared in half the time: from whence it feems more than probable, that the quick evaporation of water, in fome cafes, muft arife from a heat reaching to, or affecting the earth under the water; and that, if care be taken to make the ditches or ponds fo deep that the heat of the fun fhall not warm the earth at their bottom, the quantity evaporated will be but fmall, and fuch as will not be prejudicial to the health of the neighbouring inhabitants, if neither animal nor vegetative bodies are fuffered to rot in them. The way to prevent this is by keeping the water free from grafs, or other impurities, which may give fhelter to animals, whofe rotting, as well as that of the grafs, or of thofe impurities, communicates a putrid taint to the exhalations. It is in this cafe neceffary, that the banks of ditches, or ponds, be floped as little as the ftrength or ftiffnefs of the earth will permit.

Though lofty and bleak fituations are too often deftitute of trees, villages built in vallies are as frequently too much crowded with them; which muft be attended with the inconvenience of not having a free circulation of air, to carry off the moifture arifing from the earth, and perfpiring from fo many trees. The antients would have built fuch villages on rifing grounds, to avoid the too fultry heat of the fummer; or they would have preferved a free circulation of the atmofphere, to prevent the bad effects of a ftagnating moift air.

On the firft fettlement of the Englifh in North America, they imitated our cuftom of building in vallies, and near rivers: but experience foon taught them, that fuch places are more subject to the suffocating sultry heat of the summer, and, what they little expected, to a greater severity of frost in the winter, than rising grounds generally are. We have been informed by one of the most curious and intelligent observers of the laws of nature of perhaps any man on that continent, that the cold there, in their hardest frosts, is found to be so severe in the vallies, to a certain height, as sometimes to kill every tender vegetable, while those on the higher grounds escape. This generally takes place to a regular determined height, above which the Americans now build their houses. If we be allowed to offer a conjecture concerning the cause of this, we should say, that the effect of the cold seems to be limitted to the height to which the great moisture of the air arises at that season. In the hard winter of 1739-40, the same happened in this kingdom, when the frost was much less severe in its effect in the hilly countries, than in the low lands.

Dr. Pringle, in his excellent treatise before mentioned, points out the disadvantages of planting so many trees as there generally are in most parts of the Netherlands. The same practice may be as justly blamed in many of the flat moist counties in England, especially where they border on marshes. Their speedy growth tempts the inhabitants to plant, at the sides of their ditches, willows, and other trees, which delight in a moist soil; and these not only prevent a free circulation of air, but also perspire a great deal of moisture. Dr. Pringle confirms this by the following instances.

" At Eyndhoven, two battalions of the guards were quartered in the town, and the third lay without, in the peasants houses, all within the compass of a mile; yet, what was remarkable, this without the town had always three times more sick in the returns, than either of the other two, notwithstanding one of them had been very sickly the year before in Zealand. Now, the height of the ground being alike in all, the difference in point of health could be ascribed to nothing, but to the greater moisture of the cottages; for in all other points, these corps were equal, as in diet, duty, and exercise. A similar case occurred in the cantonment of a regiment of foot, whereof one company being quartered in houses that stood upon a heath, enjoyed a tolerable degree of health, while the rest that dwelt in a wood were remarkably sickly. As a further proof how prejudicial it is to have the air confined by close plantations in so moist a country, it was observable, that the Dutch camp at Gilsen, bordering on our cantonment, but lying on an open heath, preserved a good share of health, while we were at the worst. It was not a little curious to observe, how the agues declined proportionably with the withering and falling of the leaf. At this time less moisture ascends, and by the shedding of the leaves the villages come to be more open and perflated, and of course more dry and healthful. While the troops were very sickly in Zealand, commodore Mitchel's squadron, which lay at this time at anchor in the channel, between South Beverland and the island of Walcheren, in both which places the distempers raged, was neither afflicted with fever or flux, but amidst all that sickness enjoyed perfect health: a proof that the moist and putrid air of the marshes was dissipated, or corrected, before it could reach them; and that a situation open to the winds is one of the best preservatives against the maladies of a neighbouring low and marshy country."

The driest spot in a low flat or fenny country should be chosen for a dwelling-place. Even where there is gravel or sand on the surface, care should be taken that the springs do not rise high. Dr. Pringle points out the necessity of this caution, from what he observed in the lower parts of Brabant, " which is a barren sand, where so little water is seen, that, at first sight, the country is deemed dry and healthful: but the appearance is deceitful; for water is every where to be found at two or three feet from the surface: and in proportion to its distance from thence, the inhabitants are more less free from diseases."

Mr. Worlidge directs, that, in low moist grounds, cellars should be made under the house, with good cielings, or rather arched walls; for that this will conduce much to its dryness and healthfulness. The importance of rendering houses dry appears in many instances mentioned by Dr. Pringle: but we shall give only that in his twelfth page. " One quarter of Ghent, called St. Peter's-hill, stands high above the rest of the country; and in this the barracks, having drains and free air, were quite dry; so that the men who lay there enjoyed perfect health. But the rest who were quartered in the low part of the town, where their barracks were mostly the ground-floors of waste houses without drains, and of course very damp, were all sickly."

The bed-chambers, in such situations, more especially, should be in the driest and most elevated part of the house, and where the morning sun may contribute most to keep them dry. If they are so situated, that the sun does not warm and dry them, they should be frequently aired with fires; the oftener in proportion to the greater dampness of the place: for this has been found to contribute greatly to the health of the inhabitants. We are informed by a gentleman who has experienced it in many instances, that, by this sole precaution, he has preserved several families from the ague, when that distemper was very epidemic in the neighbourhood. How much the dryness of bed-chambers contributes to health is confirmed by what Dr. Pringle observes to have happened at Bruges, where the soldiers that lay in the upper stories kept their health remarkably better than those who were below on the ground floors.

As brick walls render houses drier than those of stone, and of a more equal warmth than plaistering, Mr. Worlidge directs, that, " where bricks can be had, the walls should be built with them, as may be done for little cost, if you raise firm and strong columns at the corners of the house, and where it is necessary to support the main beams. You may build these square, and between them raise the walls with the same materials, and work them up together with the corners and columns, leaving one half of the extraordinary breadth of the column without, and the other within the walls, whereby you will save much charge in materials and workmanship, and yet your house will be firm and strong."

We are too little attentive to the situation of houses with regard to rivers; though a judicious choice in this must be of great consequence to the health of the inhabitants. A quick flowing stream, with a clean channel and dry banks, will rather add to the beauty and healthiness of a country: but oozy banks, over-run with reeds, or other strong coarse grass, should be carefully avoided, as being a shelter to all manner of putrid filth, whence unsalitary vapours must arise. It is a general opinion, that it is safer to dwell on the north than on the south-side of a river; but experience seems to prove the contrary, especially in warm climates. Marshes, which are sometimes overflowed with salt water, are found to be more unwholesome than fresh water marshes. Their neighbourhood should, therefore, be carefully avoided.

The Romans were universally agreed, that it was much better to occupy a small farm than a large one; and laid it down as a rule, that the farmer ought to be stronger than the farm; because in the struggle which will arise between them, if the farm be too strong for the farmer, he must be ruined; that is, if the extent of the farm be such, that he cannot bestow a due culture on every part of it, he must be a loser: for, as Columella remarks, " it is certain, that a large tract of land, not rightly cultivated, will yield less than a small space well cultivated."

A judicious correspondent of the editors of the Museum Rusticum rightly observes, that the stocking of a farm is a point of great importance, and requires as much judgment and foresight as any other point in husbandry.

" The bad success of great numbers, continues he, is owing to their not having a sufficient sum of money to begin with, which inevitably involves them in difficulties, and reduces their profit on every article of their produce. Their farms are understocked; they sell at a constant disadvantage; their fields are not half cultivated; and in a short series of years, unless some lucky hit sets them up, they grow poor, in spite of all possible industry, judgment, and application.

" Even a low and easy rent will seldom remedy the want of mony at setting out.

" The

"The want of judgment, in proportioning the quantity of each particular kind of ſtock to the quantity and nature of the lands of a farm, is alſo attended with great loſs.

"For inſtance; if a farm requires four horſes, or two ploughs, and the farmer keeps only three, or a plough and a harrow, his field cannot be ſufficiently cultivated, even according to the ideas of culture common among farmers; and of courſe in a few years his lands muſt be in very bad order, to his great annual loſs.

"On the contrary, to overſtock himſelf with horſes, is to keep what will inevitably eat him out of houſe and home: the expences attending them are very great, and if they are not kept conſtantly at work, their owner muſt neceſſarily loſe by them. But it will not be amiſs to explain myſelf more particularly on this head.

"I am ſpeaking at preſent of the practice of farmers, ſome of whom overſtock themſelves with horſes, without giving their lands extraordinary ſtirrings on that account. If a farm, which commonly requires three horſes, has four kept, and is conſequently ploughed and harrowed proportionably more, the farmer will be no loſer by his fourth horſe; but the caſe is very different when he is kept without being worked to the beſt advantage of the farm.

"It is not to be at once perceived how much is loſt by not having the number of horſes proportioned to the land; nor can this always be done.

"A farmer may find it neceſſary to keep four horſes, and when he has got them, it is a chance but he could perfectly well manage ſeveral fields more with them; and when a man has an opportunity of hiring additional fields, then ſhould his judgment come into play, to take no more than his old ſtock will manage to advantage, unleſs he has a ſum of money ready to make an addition to it.

"The ſame ill conſequences attend either over or underſtocking a farm with all other cattle: and it would be the farmer's advantage was he always to remember, that three beaſts, of any kind, well fed, pay better than four without their bellies full. On the contrary, not to keep the ſtock neceſſary, is to ſubmit to a conſtant loſs. Both theſe ſorts of conduct are frequently followed, to the great unprofitableneſs of farming.

"The proportion of the paſture and arable lands of a farm is of great conſequence towards the occupier's making a profit of his buſineſs.

"The unprofitable practice of ploughing up paſtures, and not laying them down again, which is ſo univerſal in this country among farmers, whenever their landlords will allow it, tends perpetually to impoveriſh them. They are all, to a man, mad after ploughed lands, and would willingly break up every acre of graſs in their farms.

"So general an opinion among them would make one think the practice really profitable; but the contrary appears beyond all contradiction to be the truth; I mean, according to the culture at preſent purſued in this country.

"Two thirds of the land of a farm in a rich country ſhould be graſs; and a little one had better all be ſo. The vaſt expences of the plough, without doubt, keep many farmers poor, who, if their farms were graſs, would not run half the hazard, and enjoy a much better income.

"Particular points of bad management, for want of ſenſe or knowledge, through ſlovenlineſs, idleneſs, or other obſtructions to any profitable huſbandry, are not what I mean to ſpeak of here, ſince they are ſo very various, and ſo totally ruinous, that no reaſoning can be concluſive, unleſs all ſuch exceptions are made.

"The improper quantity of land in a farm is often againſt the farmer's profit.

"Very large tracks, of two or three thouſand acres, which are common in Norfolk, are too extenſive for one farm. It is impoſſible for one man to cultivate ſuch a quantity of land well: much of it muſt be neglected, and but little perfectly managed.

"Great profit indeed ariſes from moſt of theſe farms; but they take a very large ſum of money to ſtock and manage them properly.

"Very ſmall ones, unleſs the farmer does the whole buſineſs himſelf, are equally liable to objection. The medium, which is ever, in proportion, the moſt profitable, is that quantity of land which will admit of being ſtocked and farmed without the want of either any addition or diminution. What I mean is this:

"Let us ſuppoſe a farm to conſiſt of ſeventy acres of land, twenty of them graſs, and the reſt arable, in a rich country, the land from ten to ſixteen and ſeventeen ſhillings *per* acre; the occupier muſt keep one ſervant, and if he does not work hard himſelf, one labourer all the year, beſides ſome additional help at buſy times.

"I know there are many ſlovenly men, who cultivate (if their management deſerves that name) ſuch farms with fewer hands than I have mentioned; but their conduct can be no rule to good farmers. Four horſes are alſo neceſſary for ſuch a farm.

"Now, for the ſame ſtanding expences of ſervants wages, horſes, &c. the ſame number of ploughs, harrows, tumbrils, waggons, &c. &c. one hundred acres, or better, might be farmed with the ſame proportional profit: in this caſe, therefore, the tenant of ſeventy acres loſes conſiderably for want of thirty or forty more. Indeed we ſeldom meet with a farm nicely proportioned to the ſtock on it.

"There are many very evident reaſons why farming ſhould prove unprofitable to gentlemen who undertake to cultivate a part of their eſtates, whether for their amuſement or convenience, or, generally ſpeaking, even for profit.

"A very fine Norfolk farm, of a large extent of country, the rent exceeding low, and a gentleman willing to be at the expence of marling, in ſuch a caſe, there is no fear of a conſiderable profit, even without perpetual attention: but in common farms, in rich countries, no profit can ariſe to any gentleman that does not give the buſineſs conſtant attention, and deſcend to *minutiæ*; which may be too diſagreeable for him to ſubmit to.

"What I mean by profit, is not making the rent which he might receive from the tenant without trouble, and without hazard, but that additional ſum which is the farmer's profit after his rent and all expences are paid. This is ſcarcely ever made by gentlemen, who farm either for convenience or amuſement; and, excepting graſs grounds, I am perſuaded they loſe conſiderably by keeping land in their hands. The plea of growing enough for family uſe of wheat, oats, &c. is a miſtaken one; they had better by far buy every article, than have any thing to do with the plough.

"When I am told that farming anſwers to gentlemen, who I know do not give the farmer's attention to the buſineſs, I never believe it, or, at leaſt, am perſuaded that no regular accounts are kept. It will not be difficult to produce ſome good reaſons for this incredulity.

"It ſhould be remembered, that the farms which gentlemen keep in their own hands are ſeldom above fifty, ſixty, ſeventy, or an hundred a year, and not often ſo much. It is no eaſy matter for a farmer, with induſtry, ſobriety, and application, to make above a rent profit in ſuch a farm; and I believe but ſeldom ſo much. This is with every advantage of underſtanding his buſineſs, applying cloſe to it, and doing ſome work (if his farm is ſmall, a great deal) himſelf: how unlikely is it therefore that a gentleman, who may probably want theſe advantages, ſhould make near that profit, or, indeed, any at all!

"In the firſt place, a principal part of his buſineſs, his buying and ſelling, is tranſacted by his bailiff, or head ſervant, who muſt be paid for his trouble. He may be lucky enough to meet with an honeſt one; but I would never adviſe any one to let the profit of his farming depend on the honeſty of other people. Suſpicion, to the open generous mind, is irkſome and grating: but the farmer ſhould ſet out with the maxim of Deſcartes—to doubt of his very exiſtence, and ſuppoſe every man a knave till he finds him honeſt.

"But there are many inconveniencies, beſides theſe, in truſting to bailiffs.

The gentleman we muſt certainly ſuppoſe to be ignorant of farming; and he is then, of courſe, in danger of having an ignorant ſervant, without the ability of detecting him. However, the ſingle expence of a bailiff, or a head ſervant, which are much the ſame, is too great to be kept conſtantly

constantly for a small farm; and in their absence the gentleman must depend on himself.

"This is palpably no dependence at all; for can it be expected that he will forego his diversions, his excusions of pleasure, the company of his friends, the joys of society, to attend to his farm? I could almost as soon believe, that his wife would renounce an opera or a ball for the pleasure of dancing attendance on her butter and cheese in the dairy. The rural joys of romance are pretty much out of date now; and, alas! there is great difference between the employment of a farmer's wife in England, and keeping sheep in the plains of Arcadia.

"But to return:

"There are, even in a small farm, a thousand objects which require constant attendance.

"Cattle of no kind will thrive but in the master's eye: every variation of the season to be remarked; the lucky moment for ploughing, harrowing, sowing, reaping, &c. to be caught, and used with diligence and foresight; fences for ever to be attended to; and, in short, a million of other things, which require constant thought and endless application.

"That single article, the employment of labourers, will alone run away with the profit of the whole farm.

"But surely it appears plainly, from what I have said, that the unprofitableness of farming is scarcely ever owing to the art itself, but to the mistakes of those who practise it.

"As I have been so particular in distinguishing several points by which the followers of it lose, I shall now trespass a little longer on your patience, and give my sentiments on the custom of gentlemen's farming, in other respects than that of profit, to those who are not solicitous about it, and in relation to it, to those whose fortunes will not allow an indifference to such a point.

"It is scarcely possible for a gentleman to live in the country without finding many inconveniencies in not keeping a team of farming horses, with waggons, carts, &c. and other implements used in the business of husbandry. While profit is not considered, there will flow a multitude of agreeable circumstances from farming, which will have some relation to almost every particular of a country life.

"In respect of entertainment, what more rational, or more amusing, than country business, without the anxiety of caring for profit! The public good calls loudly to all gentlemen to keep some land in their hands, that experiments may be made, and modes of agriculture pursued, different from the practice of the neighbourhood, for the farmers, at least, to see that their own customs are not the only good ones, and that there are improvements to be made even on their practice.

"All the improvements and new inventions in agriculture come from gentlemen; scarcely one, that I ever heard of is known to have been discovered by farmers.

"I do not wonder at this, for I think it is natural enough; but at the same time, it is a strong reason for gentlemen's farming, whether they make profit by it or not. The expensive use of manures, and introducing a garden culture into the field-husbandry, were the effects, among a hundred other instances, of gentlemen's farming.

"But if the public good was not to be considered, yet the mere amusement of farming to a gentleman of fortune, who has the least taste for country business, must plead warmly for its practice. Such farmers soon make a garden of their estates, at the same time that they improve the value of them.

"What can be more amusing than experimental agriculture? trying the cultivation of the new-discovered vegetables, and all the modes of raising the old ones; bringing the earth to the finest pitch of fertility, and growing plants infinitely more vigorous and beautiful than any in the common tillage; using the variety of new machines perpetually invented, and observing their effects; and, in a small extent of ground, see the growth of an infinite variety of vegetables, unknown in the common practice; perpetually enjoying the neatness of husbandry, that *simplex munditiis* of farming, which gives the most beautiful colouring to every object around, and pleases the refined imagination with the enchanting prospect of all the elegance of nature.

"Those gentlemen of small fortunes, who, if they practice any thing of farming, find it necessary not to be indifferent to profit, have many points to consider.

"Such an one should remember, that though a farm will afford amusement, it will not yield profit without application. A constant attention to every article is highly necessary. He should keep the exactest accounts, and make memorandums of what knowledge he can pick up. For a few years he must employ a bailiff; and he will find that every day and hour will increase his own knowledge, if he is attentive to business." *Museum Rusticum, vol.* IV. *page* 264.

We shall conclude this article with the following

"*Prices of Implements of Husbandry, Corn, and Farming-Work, in the North Part of Hertfordshire, about Hitchin, Baldock, and Stevenage.*

A waggon complete, from 16 to 20 l.

A cart complete, from 8 to 10 l.

A two-wheeled plough complete, with draught-chain, and splinter-bars, or whipple-trees, 3 l.

A wheat two wheeled sowing-plough, as the same wheels serve for both, 1 l. 1 s. 6 d.

A foot, swing, or dray-plough complete, 1 l.

A roller complete, 15 s.

A five-barred harrow ditto, 17 s.

A four-barred harrow ditto, 15 s.

A three-barred harrow ditto, 12 s.

First ploughing per acre, 6 s.

Second ploughing per acre, 5 s.

Harrowing per acre, 6 d.

Rolling per acre, 4 d.

Hoeing turnips per acre, 4 to 5 s.

Hockling, or cutting up and raking haulm, 2 s. 6 d. per acre.

A harvest-man has per month from 33 to 40 s. and his diet.

A ploughman, for a day's work, 8 d.

A labourer, 1 s. per day, and small beer.

Price of threshing per quarter, wheat 2 s. barley 1 s. oats 9 d. pease 1 s. 4 d.

Price of horses, from 5 to 15 l.

Price of cows, from 3 to 8 l.

Price of sheep, from 10 to 20 s.

Hogs, from 5 to 40 s.

Wheat per load, 30 to 35 s. Five bushels make a load, and eight loads, or forty bushels, a waggon-load.

Barley, 24 s. per quarter.

Oats, 16 s. per quarter.

Pease, 17 s. per load.

Thetches, or vetches, 25 s. per load.

Malt, 4 s. 6 d. per bushel.

Note, Our bushel is nine-gallon measure.

Turnip-seed, 3 d. per pound.

Red clover-seed, 4 d. per pound.

Trefoil-seed, 2 d. per pound.

Cinquefoil-seed, 4 s. per bushel.

Wheat-straw, 10 s. per load.

Barley and oat-straw, 6 s. per load.

Cinquefoil-hay, per hundred, 2 s. 6 d.

Clover-hay per hundred, 2 s. 6 d.

Thatching per square, yelming and serving included, 2 s. 6 d.

A carpenter per day, 1 s. 8 d.

A bricklayer ditto, 1 s. 10 d.

Brick at the kiln, 17 s. per thousand.

Plain tiles, 17 s. per thousand.

Pan-tiles, 10 s. per hundred.

Lime, 6 d. per bushel.

Tiling-lath, 2 s. 10 d. per bunch.

Plaistering-lath, 1 s. 5 d. per bunch.

Hurdles per dozen, 8 s.

Faggots, from 6 to 16 s. per hundred.

Making, plashing, and laying live-hedges, and ditching, 4 d. per pole of sixteen feet and a half." *Museum Rusticum, vol.* IV. *page* 78.

FARM-

FARM-YARD, the place adjoining to the farm-houfe, where cattle are foddered, and feveral other neceffary works, belonging to the farm, are performed.

FARTHING-DALE, or *farding-dale*, the fourth part of an acre of land, now generally called a rood.

FATHOM, a long meafure, containing fix feet.

FEABES, or *feaberries*, goofeberries.

FEBRIFUGE, having the power of curing fevers. *See* FEVERS.

FEBRUARY, the fecond month of the year.

This is a principal feed month for fuch as they commonly call lenten grain, and is ufually fubject to much rain or fnow, which is not unfeafonable.

Now fow all forts of grey peafe, fitches, beans, and black oats: in dry weather carry out dung, and fpread it before the plough, and alfo on pafture-ground: this being the principal month for that purpofe.

This is a very proper time for planting trees and quickfets, and alfo to plafh them; to fet willows, plants, or pitchers, and alfo poplars, ofiers, and other aquatics; and to lop trees, or cut coppices.

Sow muftard-feed and hemp-feed, if the fpring prove mild: feed your fwans, and make their nefts where the floods cannot reach them.

Soil fuch meadows as you cannot overflow or water; catch moles, and take great care of ewes and lambs where they are forward. *Mortimer's Hufbandry, vol.* II. *p.* 413.

FEED, the quantity of oats, &c. given to a horfe or other animal.

FEEDING *of cattle. See the article* CATTLE.

FEET, the bafes or fupports of an animal.

The knowledge of the feet is of the utmoft importance in purchafing a horfe. Nor is it enough that the creature have a well-proportioned foot; for if it chance to be thin or weak, the buyer will be difappointed in his expectations; as fuch a foot is liable to be fpoiled in fhoeing, by travelling on hard ftony ground, by too much draught in hot feafons, or by too much moifture in winter. A thin foot is that where the cruft or horn is thin. This may be very eafily feen when the fhoe is taken off, becaufe the verge all round the fole will appear thin, and where it is fo a horfe will winch with the leaft touch of the pincers. The heel and frog are alfo apt to be foft and tender to the touch, and by reafon of the weaknefs natural to fuch a kind of foot, it often turns awry, and one point of the heel ftands higher than the other.

FELL, the fkin or hide of a beaft.

FELLING, the act of cutting or hewing down.

When any tree is intended to be cut down for timber, the firft thing to be taken care of is a fkilful difbranching, or lopping off, fuch limbs, as may endanger it in its fall, many trees being annually fpoiled for want of a previous care of this kind; and therefore in very large arms, chop a nick under them clofe to the bole, and then meeting it with downright ftrokes, it will be fevered without fplitting. Take care alfo to cut the tree as near the ground as poffible, unlefs you defign to grub them up, the doing of which will be of advantage both to the timber and to the wood; for timber is never fo much valued, if it be known to grow out of old ftocks.

M. de Buffon has very juftly obferved, that the trees intended to be felled for fervice fhould firft be ftripped round of their bark, and then fuffered to ftand and die upon the fpot before they are cut. For by this means the fappy part, or blea of the tree, becomes as hard and firm as the heart, and the real ftrength and denfity of the wood has been proved, by many experiments, to be greatly increafed by it.

FEN, a general name for boggy, moorifh, or marfhy land, generally overflowed with water. *See the articles* BOG, DRAINING, MARSH, *and* MOOR.

FEN, is alfo the name of a very pernicious diftemper to which hops are fubject. It confifts of a quick growing mould, or mofs, which fpreads itfelf with great rapidity, and occafions dreadful ravages in the hop-grounds. *See the article* HOPS.

FENCE, a hedge, wall, ditch, bank, or other inclofure, made round fields, woods, gardens, &c.

No foreft trees fhould be admitted into the hedges that divide fields, as their fhade, and wide extending roots, are found very injurious to corn, grafs, and even to the hedge itfelf. But in countries where inftead of hedges, the fences are chiefly made of rough flakes of ftone, piled dry one upon another, or a little earth thrown in between them, to fill up the chafms, a plantation of trees within thefe walls will hide their deformity, and give a warmth which cannot be expected from fuch walls.

The moft ufual way of inclofing land is with a ditch and a bank fet with hawthorn, crabs, black thorn, holly, or white thorn, commonly called quick. Mr. Miller's inftructions in this refpect are very full, and contain among others, the following directions.

"It will be proper before planting to confider the nature of the foil, and what forts of plants will thrive beft in it; and alfo what the foil is from whence the plants are to be taken: for if the ground they are taken from be better than that into which they are to be put, it will be more difficult to make them grow. Thofe which have been raifed on the fpot near the place where they are intended to be fet, will always do beft, if they are to be tranfplanted; and the next to them will be fuch as are taken from a nurfery.

"I would recommend the white thorn, the black thorn, and the crab for outward fences to good ground: but I do not approve of intermixing them.

"The white thorn is the beft quick to plant, becaufe it is the moft eafily procured, is very hardy and durable, and may be rendered the clofeft of any fence, by proper clipping. It, therefore, is preferred to all others for outward fences, or for the divifion of fields, where they are expofed to cattle, &c. It may be raifed either from fets or from feeds. The former is the moft common way of propagating it: for the latter, which may very properly be fown where the hedge is intended to ftand, do not rife till the fecond fpring. The white thorn will thrive on almoft any well loofened foil, except the drieft gravel or fand.

"The black thorn and crab make very good fences, and are to be raifed in the fame manner as the white thorn: but if the kernels of apples or crabs be fown, it is beft to fow the pommace with them; for they will then come up the fooner, that is to fay, the firft year.

"The black thorn is not accounted fo good for fences as the white thorn, becaufe it is apt to run more into the ground, and is lefs certain as to the growing: but, on the other hand, its bufhes are much better, and more lafting, than thofe of the white thorn, or indeed any other fhrub, for dead hedges, or to mend gaps: nor are they fubject to be cropt by cattle, as the others are. The richer the mould is, the better the black thorn will profper: but it will grow on the fame fort of foil as the white thorn.

"The holly makes an excellent fence, and is preferable to all the reft; but it is difficult to be made to grow at firft, and is a flow grower. However, when it does grow, it makes amends by its height, ftrength, and thicknefs. It delights moft in ftrong grounds; but will grow upon the drieft gravel, even among rocks and ftones. It is raifed from fets, or berries, like the hawes of the white thorn, and lies till the fecond fpring before they come up. Thefe two are beft fown in the place where they are intended to ftand. They fhould be well weeded, both before they come up, and afterwards, till they are grown to fuch a fize, as, of themfelves, to kill the weeds.

"French furze will make good hedges upon dry fandy banks, where few other plants will grow: but they muft be kept very clean at the bottom, and never fuffered to grow too high: nor fhould they be clipped either in dry weather, late in autumn, or early in the fpring; becaufe the cutting of them at thofe feafons is apt to make them die in patches, which is irrecoverable; as no new fhoots will here ever proceed from the old wood.

"Alder planted on a bank, the fide of which is wafhed by a river or ftream, will make an extraordinary fence, and preferve the bank from being undermined by the water; becaufe the alder is continually putting forth from the lower roots fuckers, which are of great advantage where the current of the water wafhes away the earth.

"If there is to be a ditch along the hedge, that ditch fhould be at leaft fix feet wide at top, three feet deep, and only one foot and a half over at the bottom, that each fide may have a proper flope: for where its fides are dug too perpendicular, they are very apt to fall in after a hard

froft,

froſt, or heavy rain; and if the ditch is made narrower than here directed, it will ſoon be choaked up in autumn, by the falling leaves, and the growth of weeds: nor will it be a ſufficient defence for the hedge againſt cattle.

"When the bank at the ſide of this ditch is to be planted with quicks, the ſets ought to be about as thick as a gooſe quill, and their tops ſhould be cut off within four or five inches of the ground. They ſhould be freſh taken up, ſtrait, ſmooth, and well rooted. Part of the turf taken off the ſurface of the ground where the ditch is to be dug, ſhould be laid, with the graſſy ſide downward, on the ſide of the ditch, where the bank is intended to be made, and ſome of the beſt mould ſhould be laid upon it, to bed the quick. The ſets of quick, prepared as before directed, are then to be laid upon that mould, a foot aſunder, with their cut ends ſomewhat ſloping upward. When this firſt row of quick is thus laid, it muſt be covered with mould; ſome of the remaining turf muſt then be laid upon that mould with the graſs ſide downward, as before; and more mould muſt afterwards be laid upon this turf. When the bank has, by theſe means, been raiſed about a foot high, a ſecond row of ſets ſhould be laid in the ſpaces between the lower quick, and with their ends turned the oppoſite way, in order to thicken the bottom of the hedge. Theſe are then to be covered in the ſame manner as the former: the bank is to be topped with the bottom of the ditch; and a dry or dead hedge muſt be made on the other ſide, to defend the young plantation from cattle.

"To make theſe dead hedges, ſtakes ſhould be driven into the looſe earth, ſo low as to reach the firm ground. They ſhould be about two feet and a half aſunder. Oak ſtakes are reckoned the beſt, and black thorn and ſallow the next. When they are fixed, ſmall buſhes ſhould be laid at the bottom, but not too thick; for that would make the buſhes rot. The upper part of the hedge ſhould be laid with long buſhes, to bind the ſtakes in, by interweaving them: and, to render this hedge yet ſtronger, it may be eddered as it is called, that is, the tops of the ſtakes may be bound in on each ſide, with ſlender long poles or ſticks. When this eddering is finiſhed, the ſtakes ſhould be driven anew; becauſe the doing of that, together with the weaving of the hedge, will probably have looſened them.

"The quick muſt be kept conſtantly weeded, and ſecured from being cropped by cattle, and in February it ſhould be cut to within an inch of the ground; for this will make it ſhoot ſtrong, and greatly help its growth.

"When a hedge of this kind is about eight or nine years old, it will be proper to plaſh it; the beſt time for which is in October, or February.

"After it has ſtood twenty or thirty years, and there is in it old ſtubs, as well as new ſhoots, thoſe ſtubs ſhould be cut ſloping off within two or three inches of the ground, except the beſt and longeſt of the middle ſize, which ſhould be left to lay down, and ſome of the ſtrongeſt, which ſhould be cut off at the height of five or ſix feet, according to the intended height of the hedge. Theſe laſt may be left to ſerve inſtead of ſtakes, and freſh ſtakes ſhould be put wherever they are wanted. The hedge ſhould be thinned, ſo as to leave on the ſtubs only ſuch ſhoots as are deſigned to be of uſe, that there may be room left to put a ſpade in between them, in order to give the earth as good a ſtirring as poſſible. The ditch alſo ſhould be cleanſed, and its ſlopes carefully repaired; and where the earth has been waſhed from the roots of the quick, or is hollow, it ſhould be faced anew with ſo much of the firſt ſpit of earth as there is occaſion for. The ſecond ſpit of this earth ſhould be laid on the top of the bank: for if it be laid on the ſide, or face of the bank, it will ſlip again into the ditch when wet comes, and perhaps drag down a great deal of the bank.

"Two extremes are to be avoided in the plaſhing of quicks: the firſt is, the laying the plaſhes down too low, and too thick; becauſe that makes the ſap run wholly into the ſhoots, and leaves the plaſhes without nouriſhment, which, with the thickneſs of the hedge, kills them. The ſecond is, not to lay them too high; becauſe this draws all the ſap into the plaſhes, ſtints the ſhoots at the bottom, and renders the hedge ſo thin, that it will neither hinder cattle from going through, nor from cropping of it.

"When the ſhoot deſigned to be plaſhed is bent, give it a ſmall cut with a bill, half through, ſlanting a little downward; then weave it about the ſtakes, and trim off the ſmall ſuperfluous branches that ſtraggle too far out on either ſide of the hedge.

"If the ſtubs are very old, cut them quite down: ſecure the chaſms with a good dead hedge on each ſide, till the young ſhoots are got up tall enough to plaſh; and plant new ſets in the vacant ſpaces.

"If the bank for a fence be without a ditch, and it is intended to make a hedge of quicks, the ſets, prepared as before, ſhould be planted in two rows, almoſt perpendicular, at the diſtance of a foot from each other, in the quincunx order; ſo that, in effect, they will be only ſix inches aſunder." *Miller's Gard. Dict.*

When the plants of the thorn are themſelves ſtinted, or much decayed, as they generally are pretty ſoon, through the unmerciful wounds given them by unſkilful hedgers; inſtead of plaſhing them, the farmer's beſt way will be to dig them up, and plant young ſets in their ſtead. The only inconvenience attending this renewal is the expence of a dead hedge, which is not wanted in plaſhing: but I queſtion much, whether the healthineſs of the plants, when cut ſmooth, and in ſuch a manner as not to retain water, may not ſufficiently compenſate that charge. For the ſame reaſon, it ſeems to be moſt rational to cut the plaſhes upward; becauſe the wound will then be covered from the wet, at leaſt in ſome degree, by the ſlip which remains prominent over it.

Beſides the plants already mentioned for hedges, the ſweet-briar, or eglantine (dog-roſe) is thus recommended by a correſpondent of the ſociety of improvers in the knowledge of agriculture in Scotland, who had tried in vain, in that country, all the methods of fencing uſually practiſed in Hampſhire and Eſſex.

"Obſerving that no creature ate up or deſtroyed the ſweet-briar or eglantine (dog-roſe) I gathered the hips of this plant, and laid them in a tub till March: the ſeeds then rubbed out eaſily, and I ſowed them in ground prepared for garden-peas. By this means I got my crop of peas without prejudice to my briars, which came up the next year; and the year after, when they were about a foot high, I planted them in the following manner.

"After marking out my ditch, I laid my plants about eighteen inches aſunder, upon the ſide graſs, and covered their roots with the firſt turfs that were taken off the ſurface of the intended ditch. The earth ſide of theſe turfs was placed next to thoſe roots, and upon the turfs was laid other earth, taken out of the ditch, which I then finiſhed. In four or five years, theſe plants made a fence which no ſheep, cattle, or horſes could paſs. If old briars are dug up, and divided, they make excellent plants. Where the fences are thin, they may be eaſily thickened, by laying down branches; for theſe will make ſhoots of ſix or ſeven feet in a year. They bear clipping very well.

"In ſandy places, I ſeldom dare to throw all the earth out of the ditch at once, but wait a year, till what I had thrown up is ſettled and ſwarded a little: then I raiſed my bank to the intended height. In the mean time nothing hurts my briars; and in two or three years after they have been planted, nothing can paſs the fence. Sheep ſometimes attempt it: but they ſoon are ſo entangled, that they would lie there till they die, if they were not taken out."

In the hedges which divide the farmer's fields only, fruit trees may be planted; and theſe will yield profit, as well as ornament; or the fruit may be grafted upon a ſtock in the hedge, properly ſuited thereto.

Theſe ſtocks ſhould be pruned up every year, till they are brought out of the reach of cattle, and then they may be grafted with the red-ſtreak, gennetmoil, or any other fruit. If they have proceeded from apple-kernels, they may remain ungrafted, and will yield very good cyder fruit: but then it will be longer before they bear. Alſo, if the leaf, ſhoot, and bud of a natural ſtock, promiſe more than common, a trial may be made, whether that ſtock will not perhaps produce a fine new fruit; and if it be not liked afterwards, it may then be grafted.

Mr.

Mr. Miller reckons the plants raiſed from the kernels of the ſmall wild crab much better for hedges, than thoſe which are raiſed from the kernels of any other ſort of apple; becauſe the former never ſhoot ſo ſtrong as the latter, and therefore may be better kept within the proper bounds of a hedge; and as they generally have more thorns upon them, they are better guarded againſt cattle.

Fences made in marſhy grounds require plants which delight in moiſt ſoils. Of this kind are, particularly, the black alder, the willow, and the poplar: the birch tree, and the aſh will likeways grow very well in ſuch places: but the firſt of theſe, viz. the alder, is reckoned the beſt and moſt profitable.

It likes a ſoil ſo moiſt as few other trees will thrive in, and is propagated either by layers, or planting of truncheons about three feet in length. The beſt time for planting theſe laſt is in February, or the beginning of March, when they ſhould be ſharpened at their larger end, and the ground ſhould be well looſened before they are thruſt into it, leſt the bark ſhould be torn of, which may occaſion their miſcarriage. They ſhould be ſet at leaſt two feet deep, to prevent their being blown out of the ground by violent winds, after they have made ſtrong ſhoots; and they ſhould be keept clear from all ſuch weeds as grow tall, at leaſt till they have got good heads; after this, they will keep down the weeds, and require no farther care.

If alders are raiſed by laying down the branches, this ſhould be performed in October, and by the ſame time twelvemonth they will have roots ſufficient to be tranſplanted, which muſt be done by digging a hole, and looſening the earth in the place where each plant is to ſtand. The young ſets muſt be planted at leaſt a foot and a half deep, and their top ſhould be cut off to within about nine inches of the ground; for this will make them ſhoot out many branches.

The alder tree may be trained into very thick cloſe hedges, to the height of twenty feet and upwards. It will thrive exceedingly on the ſides of brooks, for it grows beſt when part of its roots are in the water, and may, if planted there, as is uſual for willows, be cut for poles every fifth or ſixth year. Its wood makes excellent pipes and ſtaves; for it will laſt a long time under ground, or in water: and it is likewiſe much eſteemed by turners, plough-wrights, &c. and for making ſeveral utenſils neceſſary in agriculture. Its bark yields a good black dye.

All the ſorts of willows, of which Mr. Miller enumerates fourteen, grow beſt in moiſt boggy land, and may be eaſily propagated by planting cuttings or ſets, either in the ſpring or autumn: for theſe readily take root, and are of quick growth.

Thoſe ſorts which grow to be large trees, and are cultivated for their timber, are generally raiſed from ſets about ſeven or eight feet long, ſharpened at their larger end, and thruſt into the ground by the ſides of ditches and banks, where the ſoil is moiſt: but the beſt way is to make holes for them with an iron inſtrument, in order to avoid tearing off their bark. Theſe will afford very profitable loppings every fifth or ſixth year.

The middle ſized, or long leaved red willow *(Salix folio longo ſubluteo non auriculata*, Raii Syn.) and the common ſallow *(Salix folio ex rotunditate acuminato)* C. B. P. 474; willow with a rounded acute pointed leaf, have very pliable ſhoots, and therefore are the fitteſt for baſketmakers, for which reaſon they are much planted in oſier grounds. The cuttings of theſe plants ſhould be about three feet along, and taken from ſtrong ſhoots of the former year. They are commonly thruſt down two feet deep into the ground, and ſhould be about eighteen inches aſunder, if intended only for a fence; but if they are deſigned alſo for an oſier plantation, the rows, in which they may ſtill be at that diſtance, ſhould be three feet aſunder; obſerving always to plant the rows the ſloping way of the ground, eſpecially if tides overflow it; becauſe, if the rows are placed the contrary way, the filth and weeds that will be detained by the ſets will choak them up.

The beſt ſeaſon for planting theſe cuttings, is towards the end of February; for if they are planted ſooner, and a hard froſt comes on, they are apt to peel, which greatly injures them. Theſe plants are cut every year in oſier grounds, and, if the ſoil be good, they will yield ſo great a crop, that the yearly produce of one acre has often been ſold for fifteen pounds: but ten pounds is a common price. It therefore is great pity, that willows are not more cultivated, eſpecially upon boggy land, where few other things will thrive. They will not, however, do ſo well as the alder, in very watery ground. Great care ſhould be taken to ſcreen the young willows from cattle; for they are fond of them, and would ſoon deſtroy them irrecoverably, by nipping off their young ſhoots. In wine countries, the boughs of this tree are uſed either whole or ſplit, according to their ſize, for props to vines; and hoops for barrels are alſo made of them. The large wood, if ſound, is ſold to ſhoemakers for wooden heels, and to turners for many kinds of light ware.

The poplar may be propagated either from layers or cuttings, which will readily take root; and alſo from the ſuckers, which the white ſort, commonly called the abele tree, ſends up in great plenty from its roots. The beſt time for tranſplanting theſe ſuckers, is in October, when their leaves begin to decay. Theſe may be planted in a nurſery for two or three years, to get ſtrength, before they are planted out where they are to remain: but for planting of cuttings, the beſt time is the latter end of February, when truncheons two or three feet long, ſharpened at their lower ends, may be thruſt about a foot and a half deep into the ground, where, if the ſoil be moiſt, they will readily take root, and arrive at a conſiderable bulk in a few years.

The black poplar is not ſo apt to take root from large truncheons: wherefore the better way with this is, to plant cuttings of it about a foot and a half long, and about a foot deep in the ground. Theſe will take root freely, and may afterwards be tranſplanted where they are to remain. This ſort will grow upon almoſt any ſoil, but will thrive beſt in moiſt places. It therefore flouriſhes remarkably on the ſides of rivers, ponds, canals, &c.

Mr. Miller ſays, he has planted cuttings of this tree, which in four years have been bigger in the trunk than a man's thigh, and near twenty feet in height, and this upon a very indifferent ſoil: but in a very moiſt ſoil, it is common for theſe trees to ſhoot eight or ten feet in a ſeaſon: ſo that where a perſon wants to make a ſhelter in a few years, there is ſcarce any tree ſo proper for the purpoſe as this is. The Memoirs of the Berne Society caution us not to plant poplars too much within a meadow, leſt their roots ſhould damage the graſs; to which they add, that their leaves are excellent food for ſheep.

It is rightly obſerved, by the experienced gardener before mentioned, that a conſiderable advantage may be made by planting theſe trees upon moiſt boggy ſoils, where few others will thrive. There are in England many ſuch places, which do not now bring in much money to their owners; whereas, if they were planted with poplars, they would, in a few years, over purchaſe the ground, clear of all expences. But it is a too common opinion, that nothing but corn is worth cultivating in England; or, if timber be planted, it muſt be oak, aſh, or elm; and if the land be not proper for either of theſe, it is deemed of little value: whereas, if the nature of the ſoil was examined, and proper plants were adapted to it, great profit might be made by ſeveral large tracts of land, which at this time lie neglected.

The wood of the poplar, and eſpecially that of the abele, which is much eſteemed on account of its great whiteneſs, is very good for laying floors, where it will laſt many years; but being of a ſoft contexture, it is very ſubject to take the impreſſion of nails, &c. which renders it leſs fit for this purpoſe. It is alſo very proper for wainſcoting rooms, becauſe it is leſs apt to ſwell or ſhrink, than moſt other ſorts of wood. For turnery ware, none is equal to this for its exceeding whiteneſs, and great lightneſs; wherefore trays, bowls, and many other utenſils are made of it; and the bellows makers prefer it for their uſe; as do alſo ſhoemakers, not only for heels, but alſo for the ſoles of ſhoes. It is likewiſe very fit to make light carts; the poles of it are very proper to ſupport vines, hops, &c. and its loppings afford good fuel, which is a valuable article in many countries.

The birch tree, which will grow on almoſt any ſoil, be it ever ſo barren for other plants, thrives equally well in moiſt

moist springy land, or in dry gravel or sand, though the surface be but very shallow. It has succeeded so well, even upon ground which produced nothing but moss, that it has been fit to cut in ten years after planting, when an acre of these trees has sold for near ten pounds, standing, and the after-produce has been considerably increased.

The best way to cultivate this three, is to take young plants of it from the woods, where they naturally grow, and are generally found in great plenty: but in places where no young plants can be procured, they may be raised from seeds, which should be carefully gathered in the autumn, as soon as the scales under which they are lodged begin to open; otherwise they will soon fall out and be lost. These seeds are small, and therefore should not be buried deep in the ground. The autumn is the best season for sowing them; and if this be done in a shady situation, the plants will thrive better than when they are exposed to the full sun.

When young plants of birch are taken from out of woods, in order to be transplanted, they should be carefully dug up, so as not to injure their roots. The ground in which they are to be set will not need any other preparation, than loosening it with a spade or mattock, in the places where the plants are to stand, making holes to receive their roots, and closing the earth hard to them after they are set. If the plants are young, and have not much top, they will not require pruning: but if they have bushy heads at the time of their being transplanted, those heads should be trimmed, or shortened, to prevent their being shaken, and displaced by the wind. After the plants have taken root the only care requisite is, to cut down the great weeds, which would over-hang them. This may be done with a sickle, so as not to cut or injure the young trees: nor need it be repeated oftener than twice in a summer during the two first years; for the plants will afterwards be strong enough to keep down the weeds, or at least to be out of danger from them.

These young birches may be transplanted at any time between the middle of October and the middle of March, when the ground is not frozen: but autumn is the best season for planting them in dry lands, and spring for setting them in a moist soil. The distance at which they should be planted, is six feet square, that they may soon cover the ground, and by standing close draw up each other; for they will not thrive so well, if they are not pretty close, in situations where they are much exposed.

If the plants take kindly to the ground, they will be fit to cut in about ten years; and after that they may be cut every seventh or eighth year, if they are designed for broom makers only; but when they are intended for hoops, for which they are excellent, they should not be cut oftener than every twelfth year. The larger trees are often bought for turners ware; and this wood is also used for making ox-yokes, and other instruments of husbandry. In some of the northern parts of Europe, it is much esteemed for making carriages and wheels, being hard and durable. In France, it is generally used for making wooden shoes. It makes very good fuel; and the author of a dissertation in the Memoirs of the Berne Society says, that its ashes are an excellent remedy for an erysipelas, or St. Anthony's fire: but he does not tell us how they are to be used.

In some places, these trees are tapped in the spring, and the sap is drawn out to make birch wine, which has been recommended for the stone and gravel; as is also the sap unfermented. The bark of the birch-tree is almost incorruptible. Many houses in Sweden are covered with it, and it lasts many years. It frequently happens, that the wood of this tree is entirely rotten, and the bark perfectly sound and good.

To make a plantation of birch in places where the young plants can be easily procured, will not cost above forty shillings an acre, and the after expence of cleaning will not exceed twenty shillings more; so that the whole will not be more than three pounds: and if the land be of so little value as not to be worth attempting to fit it for any other growth, the proprietor cannot make a better use of his money; for when the wood is cut, it will repay the disbursement with interest, and a perpetual stock will remain upon the ground. Mr. Miller says he has seen several of these plantations made upon land which would not let for one shilling an acre, and which has afterwards produced from ten to twelve pounds an acre, clear of the expence of cutting, every twelfth year.

The ash, of which our common sort is the most hardy, most lasting, and finest grained, and consequently the most valuable, will likewise thrive in low and moist places, as well as on high and dry grounds.

The seeds of this tree sown as soon as they are ripe, will come up the following spring; but if they are not sown till the spring, they will remain a year in the ground, which, in the mean time, should be kept clear of weeds, and not disturbed, for fear of turning out the seeds, or burying them too deep. When the plants are come up, they must be carefully weeded during the ensuing summer, and if they make good progress in the seed-bed, they will be fit to transplant by the autumn; the most proper time for which is, when their leaves begin to fall. Great care should be taken not to break or tear off their roots in transplanting them; for which reason it is much better to dig them up with a spade, than to draw them out by hand, as is commonly practised, in order to have the largest only, and leave the others for a second year's growth before they are removed. But the purpose of thus separating them is very easily answered, without the danger of injuring their roots, by digging up all, and then planting them in different rows, according to their sizes. The younger they are planted out, the larger they will grow: and it is of consequence that the soil from whence they are taken, or in which they are raised, be not better than that in which they are to remain: for when any plants are raised in good land, and afterwards transplanted into worse, they very seldom thrive. The best way of all is therefore to sow them on the spot where they are most wanted: for they may easily be thinned afterwards; and it will be found that those which are left standing will grow to a larger size than such as are transplanted.

People who live in the neighbourhood of ash trees, may easily supply themselves with plenty of self-sown plants, if cattle have not been suffered to graze on the land; for if they can come at them, they will eat them up as fast as they appear. If, indeed, the seeds of the ash happen to fall under hedges, where they are protected by bushes, the plants will come up and thrive; and, through the ignorance and inattention of some husbandmen, they are too frequently permitted to grow there till they have destroyed the hedge itself; for there is scarce any tree so hurtful to all kinds of vegetables, as the ash, which robs every plant of the nourishment that is within the reach of its roots. This tree should, therefore, never be suffered in hedge-rows; nor should it ever be permitted to grow near pasture grounds; for if cows eat of the leaves or shoots of the ash, all the butter that is made of their milk will be excessively rank. Such is the quality of the butter which is made about Guildford, Godalmin, and some other parts of Surry, where there are ash trees about all the pastures. In the good dairy countries, not an ash tree is suffered to grow.

This timber is of excellent service to wheel-wrights and cart-wrights, for ploughs, axle-trees, wheel-rings, harrows, &c. It is also used by cabinet-makers, when it is found and knotty; and likewise for oars, blocks for pullies, and many other purposes.

The best season for felling these trees, is from November to February; for if it be done either too early in autumn, or too late in the spring, their timber will be apt to become worm-eaten: but for lopping of pollards, the spring is most eligible for all soft woods.

In countries where there is great plenty of rough flat stones, the fences which bound an estate, or farm, are frequently made with them. It is a pretty common practice in Devonshire and Cornwall, where they build as if were two walls with these stones laid one upon another, first two, and then one between; and as the walls rise, they fill the intermediate space with earth, beat the stones in flat to the sides, which makes them lie very firm, and so proceed till the whole is brought to the intended height. They then plant upon these walls quick hedges, and even timber trees, which thrive exceedingly; and they esteem these fences the best security that can be to their ground and cattle. However, if these stones are laid rough and dry,

dry, they cannot but be disagreeable to the eye, and must certainly require frequent repairs, because they will frequently be forced out of their places, or beaten down by cattle.

To prevent this, let such walls be built in the bottom of a ditch, made wide enough for the purpose, and sloped down on each side. The deformity will then be hid: and as the cattle cannot stand facing the wall, so as to attempt to leap over it, the stones of which it is composed will be the less liable to be beaten down. The earth taken out of the ditch may be spread on the adjacent ground, and its sides may be planted with such trees, or under-wood, as best suit the soil. If a space of several feet, proportioned to the demand which there may be for timber, is left on the inside of the fence, it will be attended with every advantage arising from a supply of that necessary commodity, without prejudice to the arable or more valuable pasture.

Another very strong and durable fence may be formed thus, in grassy places. Dig pieces of turf, four or five inches thick, the breadth of your spade, and about a foot long. Lay these turfs even, by a line, on one side, with the grass outward, at the distance of ten or twelve inches within the mark at which the ditch, afterwards to be dug in the solid ground, is to begin. Then lay in the same manner, but with their grass sides turned out the contrary way, another row of turfs, at such distance as to make a breadth of foundation proportioned to the intended height of the bank. The reason for placing these turfs thus much within what is to be the edge of the solid ground dug away on each side, is to prevent the bank from falling in, if the ground underneath it should be any way defective. A ditch, of what breadth or depth you please, may then be dug; or the ground may be lowered on each side with a slope; in which last case there will be no loss of pasture by the fence, because it may be sowed with hay seeds, and will bear grass on both sides. Part of the earth taken out of the ditches or slopes, will fill the chasm between the rows of the turf, and the rest may be scattered over the adjacent ground. Three, four, or more layers of turf may be thus placed one upon another, and the interval between them filled up as before, till the bank is brought to the desired height; only observing to give each side of it a small slope, for greater strength. The top of this bank should be about two feet and a half wide, and the whole of it should be filled up with earth to a level with the turfs, excepting a little hollow in the middle, to retain some rain. Quick sets should then be planted along this top, and they will soon form an admirable hedge. By this means, a bank four feet high, and a slope only two feet deep, will make, besides the hedge, a fence six feet high, through which no cattle will be able to force their way: for the roots of the grass will bind the turfs so together, that, in one year's time, it will become entirely solid, not a joining will appear, nor a turf can be got out; and it will be yet much stronger, when the roots of the quick shall have shot out among it. The only precautions necessary to be observed here, are, first, not to make this bank when the ground is too dry; because, if a great deal of wet should suddenly follow, it will swell the earth so much, as, perhaps, to endanger the falling of some of the outside, which, however, is easily remedied if it should happen; and, secondly, if the slope be such as sheep can climb up, to secure the young quicks, at the time of planting them, by a small dead hedge, either on or near the top, on both sides. If any of the quicks should die, which they will hardly be more apt to do here than elsewhere, unless, perhaps, in extreme dry seasons, they may be renewed, as in other places, by planting new ones, or by layers from those which remain.

A fence like this will do even for a park; especially if posts and rails, about two feet high, are placed a little sloping over the side of the bank, on or near its top: for no deer will be able to jump over this, nor can they creep through it.

This is one of the best fences to afford shelter for cattle; and if the quick on the bank is kept well clipped, it will form a kind of green wall, pleasing to the eye.

When the bounding fence is only to guard against accidents from without, it may be made in the ha-ha manner; only taking care that the earth be so well rammed down at the back of the wall, as that the stones may be properly supported, and bear equally.

The ingenious author of the Essays on Husbandry recommends the horn-beam plant, as one of the best yet known for making fences, according to the method used in Germany, where such fences are common.

"When the German husbandman, says he, erects a fence of this nature, he throws up a parapet of earth, with a ditch on each side, and plants his horn-beam sets in such a manner, as that every two plants may be brought to intersect each other, in the form of St. Andrew's cross. In that part where the two plants cross each other, he gently scrapes off the bark, and binds them with straw thwart-wise. Here the two plants consolidate in a kind of indissoluble knot, and push from thence horizontal slanting shoots, which form a sort of living palisado, or *chevaux de frise*; so that such a protection may be called a rural fortification. These hedges, being pruned annually, and with descretion, will, in a few years, render the fence impenetrable in every part. *Essays on Husbandry, essay* I. *page* 14.

FENNEL, the name of a well known plant cultivated in kitchen gardens. It is propagated by the seeds, which ripen in autumn, and should be sown soon after. They will come up in the spring, and require no other care than to keep them clean from weeds. This plant will grow in any soil or situation.

FENNY, moorish, marshy, boggy.

FENNY-LAND. *See the articles* BOG, MARSH, *and* MOOR.

FERMENT, the substance used to raise a fermentation, as yeast, wine, lees, leven, &c.

FERMENTATION, an intestine motion excited in vegetable substances, whereby the cohesion of their parts are destroyed, and may easily be separated from one another.

In every fermenting liquor, an intestine motion is generated in all its parts. It is called intestine, because it is excited by the internal principles contained in the vegetable juices; for vegetable juices or infusions made in water, however bright at first, and apparently homogeneous, on being kept in a moderately warm place, in vessels not closely stopped, become turbid, conceive an intestine motion, emit numerous air-bubbles, and discharge a pungent vapour of extreme subtilty.

All bodies which may be so changed by this intestine motion, as to produce wine, are said to be fermentable: and as this was never found to happen in any other than vegetable substances, vegetables alone are said to be fermentable.

The fermentable class of vegetables are extremely various, and might be distributed into as many classes, as they require different methods of fermenting. We shall, however, mention them no further than they relate to the pleasure and profit of the husbandman.

The first class of fermentable substances includes all the pulpous summer fruits, which, when ripe, abound with a tartish sweet juice; such as grapes, apples, pears, elder-berries, gooseberries, rasberries, currants, cherries, plums, and all other summer fruits, provided they be kept free from a tendency to putrefaction.

The second class contains the fresh expressed and native juice of plants, provided they be of a tartish and sweetish taste; such as the juice of the sugar-cane, of liquorice, and other similar plants. To this class may be added all the juices which distil from certain trees when wounded, especially in the spring; as the birch, the plane or maple, the vine, the walnut-tree, &c. The maple has this remarkable property, both in the small kind and in the great, which is called the sycamore, that, being tapped, it will bleed freely in the winter, and its juice will flow very plentifully even after a hard frost. All these juices generally run into a spontaneous fermentation.

The third class comprises those vegetable juices which are formed and inspissated by nature into a certain saponaceous substance, consisting of saline and oily particles; such as honey, manna, and all other juices which are not gummy or unctuous.

The fourth class comprehends all those seeds which, when ripe and dry, may be ground into a fine meal, without their forming an unctuous paste; such are barley, wheat, oats, rye, &c.

Certain phyſical circumſtances are requiſite to render theſe different ſubſtances fit for fermentation; namely, firſt, a perfect degree of maturity ſuitable to each kind. All ſeeds and fruits which are ſo perfect, as, when ſown in fertile ground at a proper ſeaſon, and in a proper climate, to produce a plant of their own ſpecies, are fit for this operation. Another requiſite to fermentation is a moderate proportion of oil: for though fat ſubjects are more apt to grow rancid, than to ferment, yet if they are entirely deprived of their oils, they are hereby alſo rendered unfit for fermentation. Thus, bruiſed almonds, which are rich in oil, will ſcarcely ferment; but they may be ſo far freed from their oil by art, as to be made fitter for this purpoſe. Solubility in water is a third and principal requiſite in fermentable ſubjects.

The methods of preparing each fermentable ſubſtance for fermentation will be given under the articles wine, cyder, and beer.

The juices of ſummer fruits are, of their own nature, greatly diſpoſed to ferment, ſo as immediately to begin this operation, without the addition of any other ferment. Other liquors may, however, ſtand in need of the help of other ferments, to begin this inteſtine motion, which, under proper conduct, proceeds afterwards of itſelf. The chief of theſe ferments is the recent flowers, commonly called yeaſt, thrown up to the top of beer in the act of fermentation: for if this rarified frothy matter be mixed with other fermentable liquors, it greatly promotes their fermentation. The ſame matter become heavier, and ſunk to the bottom, provided it be not too ſtale, ſtill retains the ſame vigour, though in a leſs degree than in its former ſtate. The remains of former fermenting liquors ſticking to the ſides of caſks, have the ſame effect: for caſks thoroughly penetrated by the ſubtilty of wines which they formerly contained, are extremely apt to raiſe a violent and quick fermentation in the freſh liquors put into them. Acid paſte of flour fermented, or bakers leaven, may all be employed for the ſame purpoſe: for though meal may be preſerved freſh and ſweet during years, if it be kept in a dry ſtate, and perfectly free from inſects; yet if it be wrought with water into a ſoft cloſe paſte, and lightly covered in a warm place, it will ſoon begin to heave, be all over full of cavities, change its ſmell, colour, and tenacity, prove acid both to taſte and ſmell; and thus become that proper ferment from which the whole of this operation firſt took its name. When thus prepared, if part of it be mixed with other paſte, freſh and not yet fermented, it will cauſe this to ferment much ſooner, and more ſtrongly, than it would otherwiſe do. Hence, we need not be ſolicitous about a firſt ferment, becauſe nature affords it ſpontaneouſly every where. The great promoters of all the ſtages of this proceſs are warmth, a moderate admiſſion of air, and the addition of actually fermenting matter.

If we take large glaſs bodies, place them upright where they may be kept in an equal heat, and then fill each of them three quarters full with a crude fermentable liquor well prepared for the operation, the orifice being ſlightly covered with a cloth, and a heat kept up to above ſixty degrees, it will be pleaſing to obſerve the ſeveral degrees of fermentation.

The maſs, at firſt reſting, and poſſeſſing a certain ſpace for the veſſel, gradually begins to ſwell, rarify, and conceive an inteſtine motion through its whole body, acting upwards, downwards, and ſideways, in ſtrange circumvolutions, without ceaſing, though with a different force. In the mean time bubbles are every moment formed in every part of the maſs, and conſtantly endeavour to riſe up to the ſurface, where they burſt with a hiſſing noiſe, or often break in the mid-way. Hence the whole maſs froths, diſcharging with an audible ebullition a certain tartiſh ſpirit, which proves acrimonious to the noſe, ſurpriſingly elaſtic, and capable of burſting almoſt any veſſel by its great expanſive force. If a large veſſel full of fermenting muſt, in the height of its action, ſhould diſcharge this condenſed ſpirit through a ſmall orifice, and a ſtrong healthy man ſhould draw in at his noſtrils the vapour ſo iſſuing, he would inſtantly fall down dead; or if he received but little thereof, he would become apoplectic, and remain an idiot his whole life. When this vapour is confined and accumulated in cloſe rooms, it will extinguiſh fire, and ſuffocate animals. Its producing the firſt of theſe effects is a ſign that it is collected in ſufficient quantity to cauſe the other. While candles continue to burn, we need not be afraid that this wild gaſs, as Helmont calls it, will be dangerous to life. It is on account of this ſpirit, that people are obliged to air wine-vaults, where wines are fermenting in the vintage ſeaſon, by ſetting open the windows, lighting fires, and letting in the wind.

In the progreſs of fermentation, the groſſer parts of the maſs begin to riſe to the top, and ſeparate there from the other liquor below, ſo as to collect into a ſpungy cruſt, which exactly covers the liquor underneath, and keeps in the more active parts thereof, in ſuch manner as to prevent their being exhaled and diſſipated before they have performed their effect. Now, it is curious to obſerve how great the agitation conſtantly is every where, even in the ſmalleſt part of the fluid matter, below this cruſt. A greater attrition can ſcarcely be conceived, than that which is here made with the utmoſt rapidity among all the particles. The cruſt being ſucceſſively broke, and raiſed up with a conſiderable noiſe, upon the returns of the exploſions, the exhalations eſcape, while the cruſt, preſently falling together, cloſes again, and prevents the active principles from exhaling otherwiſe. Thus, the formation and continuance of the cruſt is greatly aſſiſting in the due performance of fermentation.

As ſoon as all the groſs parts of the mixture are thus collected at the top, ſome leſs rarified particles of the lower part of the cruſt, being no longer ſuſtained by the light bubbles which cauſed them to aſcend, begin to ſink through the fluid, and are agitated upwards and downwards by bubbles in and about themſelves, by means of which they are again raiſed to the top, from whence, upon the breaking of the bubbles there, they again fall downward; and when they have done this ſeveral times, they at length remain quiet at the bottom. After this, new little maſſes do the ſame; and after ſome continuance thereof, it frequently happens that all the upper cruſt, then grown heavier, or leſs rarified, on account of the air diſcharged, ſinks of a ſudden downward, but ſoon after rolls upward, almoſt entire, with ſuch a force as would ſeem incredible, if it were not ſeen. When the upper cruſt is thus gradually conſumed and fallen to the bottom, the fermentation ceaſes, though the ſame degree of heat be continued; and the liquor, then floating over the fæces which remain at the bottom, becomes tranſparent.

So long as the cruſt remains at top, it is called the flowers of the fermenting liquor, and is the moſt proper and immediate ferment. What falls to the bottom is called lees.

The time requiſite for the perfect completing of fermentation can hardly be determined, becauſe it is different in different liquors, and depends much on the ſeaſon of the year, and heat of the weather. The juice of the palm tree finiſhes its fermentation in a few hours in Africa; and this operation is likewiſe very ſoon ended in Aſia; but in the northern countries, it proceeds ſlower. In the heat of ſummer, it proceeds quick; but in winter more languidly. It is, however, eaſy to know when the fermentation is finiſhed, viz. when the whole ſeries of the phenomena above deſcribed, has ſucceſſively appeared, and is at length ſpontaneouſly gone off. Then the veſſel ſhould be immediately ſtopped down; and the liquor ſhould be kept for ſome time on its lees, a great part of which will be aſſumed and aſſimilated by the liquor, which will thereby become ſtronger and richer in ſpirit than it was before. If the veſſel is not ſtopped down, the ſpirit produced in the fermented liquor will ſoon exhale, and leave behind only a vapid uſeleſs fluid; but if the liquor is kept quiet in a cloſe veſſel, it will gradually become more pure and ſpirituous. The ſweeter and richer the juice is, the longer does the fermentation continue, and the ſtronger and more ſpirituous is the wine or other liquor.

The diſtinguiſhing marks of a vinous liquor are as follow: It has the faculty of inebriating, or of altering the actions of the ſpirits and animal functions, by refreſhing, animating, and exhilirating the drinker: after this, it raiſes the latent paſſions (*in vino veritas*;) and finally, it deſtroys the external and internal ſenſes and voluntary motions, and thus brings on palſy, ſleep, or at laſt death.

Fermentation

Fermentation alſo changes the relaxing, ſaponaceous, cooling, and generally purging virtues of vegetable juices, into ſuch as are ſtrengthening, coagulating, and healing. Thus, the freſh infuſion of malt, before fermentation; ſolution of ſugar or honey in water; the freſh expreſſed juices of ripe ſummer fruits, &c. when plentifully drank, prove flatulent, purgative, weakening, and cooling; but when properly fermented into beer, mead, or wine, they have quite contrary qualities, which they had not before. It is a very ſingular property of fermentation, that it produces from fermented liquor a ſpirit which is convertible into a liquid flame, and yet may be perfectly mixed with water.

The things, which promote fermentation, or tend to the better performance thereof, are free admiſſion and emiſſion of air, a warmth between fifty and ſeventy degrees, and the addition of a proper ferment.

It is found that when ſweet juices are boiled down to a thick conſiſtence, they not only do not ferment in that ſtate, but are not eaſily brought to ferment, when diluted with as much water as they had loſt in the evaporation. Juices and decoctions in general, which have ſuffered much fire, however ſweet, are little diſpoſed to ferment.

One of the chief checks given to fermentation, is the fumes of burning ſulphur, received in a large quantity at ſeveral times, and ſhut up along with the air remaining on the top of the fermenting liquor. If the whole caſk be penetrated and filled with the fumes of burning ſulphur before the fermenting liquor is put in, and if the empty part on the top of the liquor be afterwards well filled with the ſame, and the veſſel cautiouſly bunged down, the fermentation will certainly be ſtopped: and if, after ſome time, it ſhould begin again, from the prevalency of its own cauſe, it may again be ſuppreſſed by the ſame fumes. The ſame end is alſo obtained by mixing with the fermenting matter a large quantity of any powerful acid, ſuch as acid ſpirits of vitriol, or nitre; though theſe at the ſame time prove hurtful to the fermenting liquor. Alkaline ſalts likewiſe, if added in a large quantity to fermenting liquors, immediately excite an increaſe of effervеſcence, which preſently ceaſing, all farther fermentation is ſtopped. But here too fermenting liquor is ſpoiled, ſo that it can ſcarcely be brought again to ferment, though it may to putrify. In the ſame manner, thoſe things which deſtroy acidity by drinking it up, hinder fermention. Thus, chalk, teſtaceous and calcarious ſubſtances, iron, lead, tin, have this effect. Stopping up the containing veſſels ſo cloſe, that nothing can eſcape or enter, will ſtop the fermentation, provided the veſſel be ſo ſtrong as not to be burſt by the force of the confined liquor. This is manifeſt in new malt liquors, which, when included in ſtrong bottles, well corked, effervеſce violently upon receiving the air. The extracting of the elaſtic air ſtops fermentation: too great heat rather diſſipates and throws off the active principles of fermentation, than excites and promotes them; and, laſtly, too great a degree of cold likewiſe ſtops fermentation.

FERN, the name of one of the worſt of weeds, and one of the moſt difficult to deſtroy where it has a deep ſoil to root in. Mr. Mortimer ſays, he has ſeen its root eight or ten feet deep in ſome grounds; and adds, that the beſt way of killing it is by cutting it often while it is in graſs; that the moſt proper ſeaſons for this purpoſe are the ſpring, midſummer, and Michaelmas: that is, when the circulation of the ſap is ſtrongeſt. Moſt of the roots being then cut aſunder, and thereby deprived of the channels through which nature intended to convey the ſap, will bleed to death, or, if it ſtagnates in them, they will ſoon rot. The fern itſelf, if cut when full of ſap, and left to rot upon the ground, will greatly improve the ſoil, and mellow it ſo as to prevent its binding: or, if it be burnt when ſo cut, it will yield a much greater quantity of ſalt, than any other vegetable. If it be ploughed up, plentiful dunging of the land, and ſprinkling it well with aſhes, have been found to kill this weed: but the moſt certain cure for it is urine. In ſeveral parts of the North, where they keep their fern under, and deſtroy a great deal of it by mowing it frequently when green, they alſo find that rolling of it is of great ſervice; and when they burn it, the poor people make the aſhes of it up into balls, with a little water, dry them in the ſun, and uſe them in waſhing their linnen, for which they think them nearly as good as ſoap. Often treading down theſe plants, and feeding Scotch ſheep on them, is ſaid to be almoſt an infallible way of killing the fern.

Trees planted among fern will thrive very much, though it be on a hot gravel; the fern ſhading their roots, and keeping them moiſt and cool.

FERTILE, fruitful, abundant, plenteous.

FERTILITY, fecundity, abundance, fruitfulneſs.

FESCUE, the name of a genus of graſs, of which there are ſeveral ſpecies; as the flote-feſcue, the ſheep's feſcue, &c. *See the articles* FLOTE-FESCUE, SHEEP'S FESCUE, &c.

FESTING-PENNY, earneſt given to ſervants when hired.

FETLOCK, the tuft of hair that grows behind the paſtern-joint of many horſes; thoſe of low ſize have ſcarce any ſuch tuft.

FETTERS, chains for the feet.

FEVER, a diſeaſe that frequently attacks ſeveral ſorts of cattle, particularly horſes.

The ſymptoms which denote the horſe to be afflicted with a fever, are great reſtleſſneſs, the creature ranging from one end of the rack to the other; his flanks heat; his eyes are red and inflamed; his tongue parched and dry; his breath hot, and of a ſtrong ſmell; he loſes his appetite, and nibbles his hay, but without chewing it, and is frequently ſmelling to the ground; the whole body is hotter than ordinary (though not parched, as in ſome inflammatory diſorders) he dungs often, little at a time, uſually hard, and in ſmall bits; he ſometimes ſtales with difficulty, and his urine is high coloured; he ſeems to thirſt, but drinks little at a time and often; his pulſe beat full and hard, to fifty ſtrokes and upwards in a minute.

The firſt intention of cure is bleeding, to the quantity of two or three quarts, if the horſe is ſtrong and in good condition; then give him a pint of the following drink four times a day; or an ounce of nitre mixed up into a ball with honey, may be given thrice a day, inſtead of the drink, and waſhed down with three four horns of any ſmall liquor.

> Take of baum, ſage, and chamomile flowers, each a handful; liquorice root ſliced, half an ounce; ſalt prunel, or nitre, three ounces: infuſe the whole in two quarts of boiling water, and when cold ſtrain it off; then ſqueeze into it the juice of two or three lemons, ſweeten it with honey.

As the chief ingredient to be depended upon in the drink is the nitre, it may, perhaps, be as well given in water alone; but as a horſe's ſtomach is ſoon palled, and he requires palatable medicines, the other ingredients may in that reſpect have their uſe. Soleyſel for this purpoſe adviſes two ounces of ſalt of tartar, and one of ſal armoniac to be diſſolved in two quarts of water, and mixed with a pail of common water, adding a handful of bran or barley-flower to qualify the unpleaſant taſte: this may be given every day, and is an uſeful medicine.

The following alſo may be given for this purpoſe:

> Take Ruſſia pearl aſhes one ounce, diſtilled vinegar one pint, ſpring water two pints, honey four ounces; give a pint three or four times a day.

This neutral mixture, and the nitre drink above, may be taken alternately; they are both efficacious remedies, and in ſome caſes may properly enough be joined with the camphor drink.

His diet ſhould be ſcalded bran, given in ſmall quantities; which, if he refuſes, let him have dry bran ſprinkled with water: put a handful of picked hay into the rack, which a horſe will often eat, when he will touch nothing elſe: his water need not be much warmed, but ſhould be given often, and in ſmall quantities: his cloathing ſhould be moderate, too much heat and weight on a horſe being improper in a fever; which ſcarce ever goes off in critical ſweats (as thoſe in the human body terminate) but by ſtrong perſpiration.

If, in a day or two he begins to eat his bran, and pick a little hay, this method with good nurſing will anſwer; but if he refuſes to feed, more blood ſhould be taken away, and the drinks continued: to which may be be added two or three drams of faffron, avoiding at this time all hotter medicines: the following clyfter fhould be given, which may be repeated every day, efpecially if his dung is knotty and dry.

> Take two handfuls of marfhmallows, and one of chamomile flowers; fennel feed an ounce; boil in three quarts of water to two, ftrain off, and add four ounces of treacle, and a pint of linfeed oil, or any common oil.

Two quarts of water-gruel, fath broth, or pot-liquor, with the treacle and oil, will anfwer this purpofe; to which may be added a handful of falt. Thefe fort of clyfters are properer than thofe with purging ingredients.

The following opening drink is very effectual in thefe fevers, and may be given every other day, when the clyfters fhould be omitted; but the nitre-balls or drink may be continued, except on thofe days thefe are taken.

> Take of cream of tartar and Glauber's falts, each four ounces; diffolve in barley-water, or any other liquor: an ounce or two of lenitive electuary may be added, or a dram or two of powder of jallap, to quicken the operation in fome horfes.

Four ounces of Glauber falts or cream of tartar, with the fame quantity of lenitive electuary, may be given for the fame purpofe, if the former fhould not open the body fufficiently.

In four or five days the horfe generally begins to pick his hay, and has a feeming relifh to food: though his flanks will heave pretty much for a fortnight; yet the temper of his body, and return of appetite, fhew that nothing more is requifite to complete his recovery, than walking him abroad in the air, and allowing plenty of clean litter to reft him in the ftable.

This method of treating a fever is fimple, according to the laws of nature; and is confirmed by long experience, to be infinitely preferable to the hot method.

The intention here is to leffen the quantity of blood, promote the fecretions of urine and perfpiration, and cool and dilute the fluids in general.

How far vinous cordials, ftrong beer drinks loaded with fiery powders, and fuch methods are likely to anfwer thefe purpofes, is fubmitted to the judicious obferver; as alfo, whether adopting the cool one in its ftead is not as real an improvement in farriery as phyfic.

There is another fort of fever that horfes are fubject to, of a more complicate and irregular nature than the former; which, if not properly treated, often proves fatal.

The figns are a flow fever with languifhing, and great depreffions; the horfe is fometimes inwardly hot, and outwardly cold; at other times hot all over, but not to any extreme; his eyes look moift and languid; he has a continual moifture in his mouth, which is the reafon he feldom cares to drink, and when he does, it is but little at a time. He feeds but little, and leaves off as foon as he has eat a mouthful or two; he moves his jaws in a feeble loofe manner, with an unpleafant grating of his teeth; his body is commonly open; his dung foft and moift, but feldom greafy; his ftaling is often irregular, fometimes little, at other times profufe, feldom high-coloured, but rather pale, with little or no fediment.

When a horfe's appetite declines daily, till he refufes all meat, it is a bad fign. When the fever doth not diminifh, or keep at a ftand, but increafes, the cafe is then dangerous. But when it fenfibly abates, and his mouth grows drier, the grating of his teeth ceafes, his appetite mends, and he takes to lay down (which perhaps he has not done for a fortnight) thefe are promifing figns. A horfe in thefe fevers always runs at the nofe, but not the kindly white difcharge, as in the breaking of a cold, but of a reddifh or greenifh dufky colour, and of a confiftence like glue, and fticks like turpentine to the hair on the infide of his noftrils. If this turns to a gleet of clear thin water, the horfe's hide keeps open, and he mends in his appetite; thefe are certain figns of recovery.

The various and irregular fymptoms that attend this flow fever, require great fkill to direct the cure, and more knowledge of the fymptoms of horfes difeafes, than the nenerality of gentlemen are acquainted with. The experienced farrier fhould therefore be confulted and attended to, in regard to the fymptoms; but very feldom as to the application of the remedy, which is generally above their comprehenfion; though it may be readily felected, by duly attending to the obfervations here inculcated.

Firft then, a moderate quantity of blood, not exceeding three pints, may be taken away, and repeated in proportion to his ftrength, fullnefs, inward forenefs, cough, or any tendency to inflammation. After this, the fever drink may be given, with the addition of an ounce of fnake-root, and three drams of faffron and camphor, diffolved firft in a little fpirit of wine; the quantity of the nitre may be leffened, and thefe increafed, as the fymptoms indicate.

The diet fhould be regular; no oats given, but fcalded, or raw bran fprinkled; the beft flavoured hay fhould be given by handfuls, and often by hand, as the horfe fometimes cannot lift up his head to the rack.

As drinking is fo abfolutely neceffary to dilute the blood, if the horfe refufes to drink freely of warm water or gruel, he muft be indulged with having the chill only taken off, by ftanding in the ftable; nor will any inconvenience enfue, but oftener an advantage; for the naufeous warmth of water, forced on horfes for a time, palls their ftomachs, and takes away their appetites, which the cold water generally reftores.

Should the fever after this treatment increafe, the horfe feed little, ftale often, his urine being thin and pale, and his dung fometimes loofe, and at other times hard, fhould the moifture in his mouth continue, his fkin being fometimes dry, and at others moift, with his coat looking ftaring, and furfeited. Upon thefe irregular fymptoms, which denote great danger, give the following balls, or drink; for in thefe cafes there is no time to be loft.

> Take of contrayerva-root, myrrh, and fnake-root powdered, each two drams, faffron one dram, mithridate or Venice treacle half an ounce, make into a ball with honey, which fhould be given twice or thrice a day, with two or three horns of an infufion of fnake-root, fweetened with honey; to a pint and a half of which may be added, half a pint of treacle-water, or vinegar, which latter is a medicine of excellent ufe, in all kinds of inflammatory and putrid diforders, either external or internal.

Should thefe balls not prove fuccefsful, add to each a dram of camphor, and where it can be afforded, to a horfe of value, the fame quantity of caftor. Or the following drink may be fubftituted in their ftead for fome days.

> Take of contrayerva and fnake-root, of each two ounces, liquorice-root fliced one ounce, faffron two drams; infufe in two quarts of boiling water clofe covered for two hours, ftrain off, and add half a pint of diftilled vinegar, four ounces of fpirit of wine, wherein half an ounce of camphor is diffolved, and two ounces of mithridate or Venice treacle; give a pint of this drink every four, fix, or eight hours.

A more fimple drink, and perhaps full as efficacious may be thus prepared:

> Take camphor one dram diffolved in rectified fpirit of wine one ounce, then gradually pour on a pint of diftilled vinegar warmed, and give for two dofes. The quantity of camphor may be increafed.

Should the horfe be coftive, recourfe muft be had to clyfters, or the opening drink: fhould he purge, take care not to fupprefs it, if moderate; but if, by continuance, the horfe grows feeble, add diafcordium to his drinks, inftead of the mithridate; if it increafes give more potent remedies.

Let it be remembered, that camphor is a very powerful and effectual medicine, in thefe kinds of putrid fevers; being both active and attenuating, and particularly calculated to promote the fecretions of urine and perfpiration. It has been long celebrated in malignant fevers, as it gives motion to ftagnant humours, in the moft diftant parts, and promotes their expulfion by the common outlets; nitre may

may be advantageously joined with it in many cases. These are the medicines that are chiefly to be depended on in putrid epidemic fevers, where the circulation is slow and languid, the blood and juices tending to coagulate, putrify, and run into grumes.

A horse should drink plentifully to promote the operation of these medicines; but instead of them, to a horse of small value, give an ounce of diapente, and half an ounce of mithridate, and one dram of camphor, with a strong infusion of rue, scordium, and snake-root, in the manner as above directed.

Regard should also be had to his staling; which, if in too great quantities, so as manifestly to depress his spirits, should be controuled by proper restringents, or by preparing his drinks with lime-water. If, on the contrary, it happens that he is too remiss this way, and stales so little as to occasion a fullness, and swelling of his body and legs, recourse may be had to the following drink:

> Take of salt-prunella, or nitre, one ounce; juniper-berries, and Venice turpentine, of each half an ounce; make into a ball with oil of amber.

Give him two or three of these balls, at proper intervals, with a decoction of marshmallows, sweetened with honey.

But if, notwithstanding the method we have laid down, a greenish or reddish gleet is discharged from his nostrils, with a frequent sneezing; if he continues to lose his flesh, and becomes hide-bound; if he altogether forsakes his meat, and daily grows weaker; if he swells about the joints, and his eyes look fixed and dead; if the kernels under his jaws swell, and feel loose; if his tail is raised and quivers; if his breath smells strong, and a purging ensues, with a discharge of fœtid, dark coloured matter, his case may then be looked on as desperate, and all future attempts to save him will be fruitless.

The signs of a horse's recovery are known by his hide's keeping open, and his skin feeling kindly; his ears and feet will be of a moderate warmth, and his eyes brisk and lively; his nose grows clean and dry; his appetite mends; he lays down well, and both stales and dungs regularly.

Be careful not to overfeed him on his recovery; let his diet be light, feeds small, and increased by degrees as he gets strength: for by overfeeding, horses have frequent relapses, or great surfeits, which are always difficult of cure.

This is the most successful method of treating these irregular, malignant fevers; where it is evident, by the various efforts nature makes to relieve herself, she wants assistance, and a spur to quicken her motions. For by the use of these warm medicines, a crisis, or termination of the disease is quickened and promoted, as appears by the alteration made both in the urine and skin; the former of which, by its thickness, shews signs of concoction, as it is called, or of a separation of the feverish matter from the blood; and the latter by its smoothness and glossiness proves that a regular and free perspiration is obtained: these two secretions are of such importance to the welfare of every animal, that the necessity of rectifying them, when disordered, is obvious from the consequences.

If this fever should be brought to intermit, or prove of the intermitting kind, immediately after the fit is over, give an ounce of jesuits-bark, and repeat it every six hours, till the horse has taken four or six ounces; should eruptions or swellings appear, they ought to be encouraged, for they are good symptoms at the decline of a fever, denote a termination of the distemper, and that no further medicines are wanted.

The true reasons perhaps why so many horses miscarry in fevers, are, that their masters, or doctors, will not wait with patience, and let nature have fair play: that they generally neglect bleeding sufficiently at first; and are constantly forcing down sugar-sops, or other food in a horn, as if a horse must be starved in a few days, if he did not eat: then they ply him twice or thrice a day with hot medicines and spirituous drinks, which (excepting a very few cases) must be extrmely pernicious to a horse, whose diet is naturally simple, and whose stomach and blood, unaccustomed to such heating medicines, must be greatly injured, and without doubt are often inflamed by such treatment.

From the experience we lately had of the epidemic cold and fever among our horses, and from the observations of others in the years 1732 and 1734, it evidently appeared that the simplest method of treatment succeeded best. Thus it is proper to bleed largely at first, to the quantity of three quarts, if the horse is full and strong: and if it appears that his lungs are not relieved by it, but continue stuffed and loaded, the bleeding should be repeated; and a rowel may be put in his chest or belly.

Dilute the blood with plenty of water, or white drink; let his diet be warm bran mashes, and his hay sprinkled. Should the fever rise, which will be known by the symptoms above described, give him an ounce of nitre thrice a day in his water, or made up in a ball with honey. Let his body be kept cool and open, with the opening drink, given twice or thrice a week; or an ounce of salt of tartar may be given every day, dissolved in his water, for that purpose, omitting then the nitre. After a week's treatment in this manner, the cordial ball may be given once or twice a day, with an infusion of liquorice-root sweetened with honey; to which may be added, when the phlegm is tough, or cough dry and husky, a quarter of a pint of linseed, or sallad-oil, and the same quantity of oxymel squills.

As the kernels about the throat are greatly swelled in these cases, I need not mention the necessity of keeping the head and throat warmer than ordinary, to promote a freer perspiration, and forward the running at the nose, which in a horse answers the end of spitting, or expectoration in us: but the nose should never be syringed, as is sometimes done, to promote this discharge, which it often checks, and occasions bad swellings in the neighbouring parts and glands; for let it be remembered these are critical runnings of nature's own appointment, which by art may soon be frustrated. The following cooling purge is very proper to give at the decline of the distemper, and may be repeated three or four times.

> Take two ounces of senna; anniseed and fennel bruised, each half an ounce; salt of tartar three drams; let them infuse two hours in a pint of boiling water; strain off, and dissolve in it three ounces of Glauber salt, and two of cream of tartar: give for a dose in the morning.

This purge generally works before night very gently; and in fevers, and all inflammatory disorders, is infinitely preferable to any other physic.

Before we close this account of fevers, it may be no improper hint to the curious, to take notice that a horse's pulse should more particularly be attended to than is customary, as a proper estimate may thereby be made both of the degree and violence of the fever present, by observing the rapidity of the blood's motion, and the force that the heart and arteries labour with, to propel it round. The nighest calculation that has been made of the quickness of the pulse in a healthy horse, is, that it beats about forty strokes in a minute; so that in proportion to the increase above this number, the fever is rising, and if farther increased to above fifty, the fever is very high.

How often the pulse beats in a minute may easily be discovered by measuring the time with a stop-watch, or minute sand-glass, while your hand is laid on the horse's near side, or your fingers on any artery; those which run upon each side of the neck are generally to be seen beating, as well as felt a little above the chest. *Bartlet's Farriery, page* 31.

FEWEL, combustible matter; as fire, wood, coal, &c.

FIELD, a piece of ground enclosed, whether for tillage, or pasture.

FIELD *scabious*, a perennial weed common among the corn. It is all over rough and hairy. The stalk is upright, and often a foot or a foot and a half high, spotted, and branching. The lower leaves are oval, and indented about the edges. Those which grow on the stalk are divided, and of that sort which botanists called pinnatifid. The flowers are blue, and of the compound kind, consisting of a considerable number of small flowers, each divided into four parts, and having one seed under them. The taste of the plant is a disagreeable bitter.

FIG-TREE, the name of a fruit-tree common in the warmer climates, and which ripens its fruit very well in our gardens.

Method of cultivating FIG-TREES.

These trees are always planted as standards, in all warm countries; but in England they are generally planted against walls, there being but few standard fig-trees, at present, in the English gardens: however, since the fruit is found to ripen well upon the standards, and the crop of figs is often greater upon them, than upon those trees against walls, it may in time become the general practice to plant them either in standards or espaliers: the latter, I think, will succeed best in England, if they were managed as in Germany; where they untie the fig-trees from the espalier, and lay them down, covering them from the frost with straw or litter, which prevents their shoots being injured by the frost; and this covering is taken away gradually in the spring, and not wholly removed until all the danger of the frost is over; by which management they generally have a very great crop of figs: whereas, in England, where the trees grow against warm walls, if the spring proves warm, the young figs are pushed out early; and the cold, which frequently returns in April and May, causes the greatest part of the fruit to drop off, so that our crop of figs is generally more uncertain than most other sort of fruit; and it frequently happens, that trees which are planted against north and east aspected walls, produce a greater quantity of fruit in England, than those which are planted against south and south-east aspects, which must happen from the latter putting out their fruit so much earlier in the spring than the former: and, if there happen cold frosty nights, after the figs are come out, which is frequently the case in this country, the forwardest of the figs are generally so injured as to drop off from the trees soon after. In Italy, and the other warm countries, this first crop of figs is little regarded, being few in number; for it is the second crop of figs which are produced from the shoots of the same year, which is their principal crop; but these rarely ripen in England; nor are there above three or four sorts which ever ripen their second crop, let the summer prove ever so good; therefore it is the first crop which we must attend to in England: so that when these trees are growing against the best aspected walls, it will be a good method to loosen them from the wall in the autumn; and, after having divested the branches of all the latter fruit, to lay the branches down from the wall, fastening them together in small bundles, so that they may be tied to stakes, to keep them from lying upon the ground; the damp whereof, when covered in frosty weather, might cause them to grow mouldy; and hereby they will be secured from being broken by the wind. When they are thus managed in the autumn, if the winter should prove very severe, the branches may be easily covered with pease-haulm, straw, or any other light covering, which will guard the tender fruit-bearing branches from the injury of frost: and when the weather is mild, the covering must be removed, otherwise the figs will come out too early; for the intention of this management is to keep them as backward as possible: then in the spring, when the figs are beginning to push out, the trees may be fastened up to the wall again. By this management I have seen very good crops of figs produced in two or three places.

I have also seen great crops of figs in some particular gardens, after very sharp winters, when they have, in general, failed in other places, by covering up the trees with reeds made into panels, and fixed up against the walls.

In the pruning of fig-trees, the branches must never be shortened; because the fruit are all produced at the upper part of the shoots; so, if these are cut off, there can be no fruit expected; besides, the branches are very apt to die after the knife; so that, when the branches are too close together, the best way is to cut off all the naked branches quite to the bottom, leaving those which are best furnished with lateral branches at a proper distance from each other, which should not be nearer than a foot; and, when they are well furnished with lateral branches, if they are laid four or five inches farther asunder, it will be better.

The best season for pruning of fig-trees is in autumn, because, at that time, the branches are not so full of sap; so they will not bleed so much as when they are pruned in the spring; and, at this season, the branches should be divested of all the autumnal figs; and the sooner this is done, when the leaves begin to fall off, the better will the young shoots resist the cold of the winter. There are some seasons so cold and moist that the young shoots of the fig trees will not harden, but are soft and full of juice: when this happens, there is little hope of a crop of figs the succeeding year; for the first frost in the autumn will kill the upper part of these shoots, for a considerable length downwards: whenever this happens, it is the best way to cut off all the decayed parts of the shoots, which will prevent the infection from destroying all the lower part of the branches; and by this method I have seen a moderate crop of figs put out from the lower part of the shoots, where, if the shoots had not been injured, there would have been no fruit produced; because it is chiefly from the four or five uppermost joints of the shoots that the fruit comes out: and it is for this reason, that as many of the short lateral branches should be preserved as possible, those being the most productive of fruit; for, where the long strait shoots are fastened up, there will be no fruit, but at their extremities; so that all the lower part of the trees will be naked, if there be not a particular regard had to supply young shoots in every part of the trees. *Miller's Gard. Dict.*

FIG, the name given by farriers to a sort of wart on the frush, and sometimes all over the body of a horse. The figs that appear on the frush or sole, discharge a malignant stinking humour, which is very difficult to cure.

FIG-WORT, *pile-wort*, or *lesser centaury*, a perennial weed common in pasture-grounds. The roots consist of oblong knobs. The leaves are heart-shaped, cornered, and placed on foot-stalks. The flowers in general resemble those of the crowsfoot, but differ somewhat from them in having the cup divided into three parts only, the petals being about eight in number, and narrower. This low plant runs very much by the roots, and choaks all others which are near it.

FILBERT, or *filberd*, a species of the hazel propagated in gardens.

Filbert-trees may be raised by planting their nuts in February; till which time they should be kept in sand in a moist cellar, where no vermin can get at them: but the most expeditious way, and at the same time the surest of obtaining the sorts desired, is to raise them from layers.

FILLER, or *thiller* horse, that fastened immediately to the cart, and which supports the shafts.

FILLY, a female or mare colt.

FIMBLE-*hemp*, early ripe hemp.

FINE-BENT, the name of a very excellent species of grass found in great plenty on the best sheep-pastures. We have given a figure of this grass on Plate XV. Fig. 4. *see the article* GRASS.

FIRE-BLAST, an accident to which hops are very liable. *See the article* HOPS.

FIRE-BOTE, a quantity of fuel.

FIRING, an operation often performed on different parts of a horse. It is done in the following manner: when the firing-iron is red hot, the farrier applies the thinnest part to the horse's skin, in one or more places, according to the nature of the disease.

Firing, or cauterizing, is often necessary after strains and other accidents, which may occasion a long continued weakness, or where there is a fullness, and the part is grown hard and callous, especially about the joints, sinews, and nervous parts, those parts being composed of an infinite number of fibres and nervous threads, which lie so close together, that nothing but what is of the most powerful nature is sufficient to relieve them when obstructed. This is performed in the most effectual manner, by burning the outside, and giving vent to the inclosed matter to discharge itself; and sometimes proves beneficial, when all other helps have been found ineffectual.

In firing about the sinews and nervous parts, great care is to be taken not to go too deep at first, but by gentle repeated

repeated razes on lines, till they come to a pale red colour; for if the fire once touches the finew, it will make the horfe go lame as long as he lives: the fame ought to be drawn pretty clofe together on each fide the joints or finews, following the courfe of the hair, without making of crofs lines, which are of no ufe in thefe parts, and are only apt to disfigure the horfe afterward.

When the more flefhy parts, or an obftinate humour, that cannot be brought to fuppuration, requires firing, the fkin ought to be pierced deeper, in order to draw away a fufficient quantity of matter from the part; the fame ought to be performed upwards, to prevent any ulcerous difpofition attending it: and in fuch cafes little foft dofils of tow, dipped in warm bafilicon, and fpirit of wine, may be thruft gently up into the orifices.

The firing inftrument, or knife, ought to be fomewhat rounded on the edge, and gradually thicker to the back, fufficient to keep the heat of the fire for fome time; the fame fhould be rubbed clean, that no dirt or afhes may ftick to it, and not ufed until the flaming rednefs is in part gone off. All the feared parts ought immediately to be bathed with fpirits of wine, and where nothing elfe is requifite to complete the cure, the place is only to be anointed with oil and bees-wax melted together. *Gibfon's Farriery, vol.* I. *page* 251.

FIRING-IRON, a piece of iron about a foot long, one end of which is made flat, and forged like a knife, the back of it being half an inch thick, and the edge about the eighth of an inch.

FIR, a timber tree very common on mountainous and barren places, efpecially in the colder climates. It differs from the pine, in having fingle leaves, which are, for the moft part, produced on every fide of the branches; whereas the pine has two or more leaves produced out of the fheath or cover.

Fir trees are raifed from feeds taken out of their polyfpermous cones. The way to get out the feeds is, either by expofing the cones to a gentle fire, or by foaking them all night in water, which will caufe their fquamous cells to open, and readily emit their feeds. The former method is the beft, provided they are not expofed to too great heat. But this ought not to be done until you are ready to fow them, which is beft performed in the beginning of March.

Thefe plants fhould be all raifed in a nurfery, where they may be protected from the birds, otherwife they will be in danger of being deftroyed, when they firft come up: for as they bring up the hufk of the feed on the top of the plant, the birds in picking off the hufk will break off the plant, whereby a whole bed may be loft in a few hours, if they are not carefully guarded from them.

The beft time of fowing thefe feeds is about the latter end of March, or the beginning of April, on a bed of light earth, covering the feeds about half an inch deep with the fame fort of earth. In this bed the plants fhould remain until the following fpring, when there fhould be a number of beds prepared in the nurfery to receive thefe feedling plants; and the beginning of April they fhould be tranfplanted into the beds, at the diftance of fix inches row from row, and at three inches afunder in the rows. If the feafon fhould prove dry, it will be proper to water the plants every week once or twice, according to the warmth of the weather; and the beds fhould be covered with mats, to fcreen the plants from the fun, and drying winds, until they have taken good root; after which time they will require no farther care, but to keep them clear from weeds. In thefe beds the plants may remain two years; at the end of which they fhould be tranfplanted into an open fpot of ground; for their roots will in that time meet quite over the beds.

The diftance which thefe plants fhould be placed in this nurfery, fhould be four feet row from row, and two feet afunder in the rows.

When the plants are planted, if the feafon fhould prove dry, they fhould be watered, to fettle the earth to their roots; and if this is repeated three or four times, if the feafon fhould continue dry, it will greatly promote their taking new root, and fecure them from the injuries of the drying winds. In this nurfery the plants may remain two or three years, according to the growth they fhall have made; and, during this time, the ground between the plants fhould be conftantly keept clean from weeds, and dug between the rows every fpring; in doing of which, care muft be taken not to cut or i jure the roots of the plants: this is all the culture they will require during their continuance in the nurfery: and, when they are tranfplanted into the places where they are to remain, the neceffary care to be taken is, in taking them up, not to injure or cut off their roots, and let them be as little time out of the ground as poffible; and, when they are out, to guard their roots from the drying winds. The fureft time for removing of thefe trees is about the beginning of April; though they may, and often are removed with fuccefs at Michaelmas, yet the fpring is the more fure feafon, efpecially in moift land.

Moft of the kinds of firs may be removed at the height of fix or feven feet; but thofe of two feet high are much better, and will in a few years get the better of thofe taller trees. *Miller's Gard. Dict.*

FISH-PONDS, refervoirs of waters, applied to the breeding or feeding of fifh.

Fifh-ponds are no fmall improvement of watery and boggy lands, many of which are fit for no other ufe. In making of a pond, its head fhould be at the loweft part of the ground, that the trench of the flood-gate, or fluice, having a good fall, may not be too long in emptying. The beft method of making the head fecure, is to drive in two or three rows of ftakes above fix feet long, at about four feet diftance from each other, the whole length of the pond head, whereof the firft row fhould be rammed at leaft about four feet deep. If the bottom is falfe, the foundation may be laid with quick-lime, which flacking, will make it as hard as a ftone. Some lay a layer of lime, and another of earth dug out of the pond, among the piles and ftakes; and when thefe are well covered, drive in others, as they fee occafion, ramming in the earth as before, till the pond-head be of the height defigned.

The dam fhould be made floping on each fide, leaving a wafte to carry off the over-abundance of water in times of floods or rains; and as to the depth of the pond, the deepeft part need not exceed fix feet, rifing gradually in fhoals towards the fides, for the fifh to fun themfelves, and lay their fpawn. Gravelly and fandy bottoms, efpecially the latter, are beft for breeding; and a rich foil with a white fat water, as the wafhing of hills, commons, ftreets, finks, &c. is beft for fattening all forts of fifh. For ftoring a pond, carp is to be preferred for its goodnefs, quick growth, and great increafe, as breeding five or fix times a year. A pond of an acre, if it be a feeding and not breeding one, will every year feed two hundred carps of three years old, three hundred of two years old, and four hundred of a year old. Carps delight in ponds that have marl or clay bottoms, with plenty of weeds and grafs, whereon they feed in hot months.

Your pond fhould be drained every three or four years, and your fifh forted. If it is a breeding one, the fmaller ones are to be taken out to ftore other ponds with, leaving a good ftock of females, at leaft eight or nine years old, as they never breed before that age. In feeding ponds, it is beft to keep them pretty near of a fize. *Mortimer's Hufbandry, vol.* I. *page* 290.

FISTULA, a deep, narrow, and callous ulcer, generally arifing from abfceffes. *See* ULCER.

FISTULAR, FISTULOUS, an epithet applied by farriers to wounds and ulcers, which degenerate into fiftulas.

Fiftular, or *fiftulous*, is alfo an epithet applied by botanifts to leaves and flowers which are tubular, or that refemble a hollow pipe.

FLAGS, the turf, or furface of the ground, which they pare off for burning. *See* BURN-BAKING.

FLAIL, a well known implement of hufbandry, ufed in threfhing all forts of corn. *See the article* THRESHING.

FLAX, the name of a plant cultivated both for the fake of its ftalk and feed, the former being ufed in making linen, and the latter for oil.

The ftem of this plant, which is round and hollow, grows to the height of about two feet, and then divides into feveral branches: thefe are terminated by blue flowers, confifting of five petals, and are fucceeded by capfules divided within into ten cells, in each of which is enclosed a bright, slippery, elongated seed. Its leaves are long, narrow, sharp-pointed, and placed alternately along the stem and branches.

The soil for flax should be a stiff loam, rendered fine by tilth, and situated in a valley bordering upon water; or such a soil as is thrown up by rivers. If there be water at a small depth below the surface of the ground, it is thought still better, as is the case in Zealand, which is remarkable for the fineness of its flax, and where the soil is deep and stiff, with water almost every where, at the depth of a foot and a half, or two feet underneath it. It is said to be owing to the want of this advantage, that the other provinces of Holland do not succeed equally well in the culture of this useful plant; not but that fine flax is also raised on high lands, if they have been well tilled and manured, and if the seasons are not very dry.

It is justly remarked in the letters which the Dublin Society have published on the culture of flax, that moist stiff soils yield much larger quantities of flax, and far better seed, than can be obtained from light lands: nay, that the seed procured from the former may, with proper care, be rendered full as good as any that is imported from Riga or Zealand: but, as M. Du Hamel rightly observes, strong land can hardly yield such fine flax as that which grows on lighter ground.

In the southern countries, the husbandmen who raise flax, sow part of their seed in September and October; so that the plants which spring from thence, remain of course in the ground all the winter; and this is a judicious practice in those places, because plants which have not covered the earth well before the summer heats come on, are apt to be parched by the heat and drouth which usually prevail in that season. They sow linseed again in the spring; but the latter do not yield so large a crop: the flax, however, which it produces is more esteemed, because it is finer than that sown in autumn. M. Du Hamel seems, indeed to think, that the autumnal sowing yields the best seed; but however that be, in places where the winter is apt to be severe, and where the flax, which is but a tender plant, would in course be in danger of being destroyed during that season, almost all the flax is sown about the end of March, or in the beginning of April. This spring flax is what we shall principally consider in this article.

It may be laid down as a general rule, that the land which is intended for flax should be brought to exceeding fine tilth by repeated ploughings, and that it should be enriched by a manure suited to the quality of the soil. Thus, when a pasture is broken up in order to its being sowed with flax, it must be well ploughed during eighteen months, or two years, before it will be fit for producing a crop of flax. To defray the expence of this culture, some other crops may be got off the land in the mean time, especially of such plants as do not occupy it long, and particularly of those which are remarkably benefited by frequent stirring of the earth whilst they grow; such as beans, pease, turnips, &c. because these repeated stirrings render the mould fine and loose, and help to kill the weeds, which would otherwise do great damage to the flax. The Memoirs published by the Society of Britanny inform us, that the Livonians, when they clear woodland, burn the wood upon it, then plough it, and in this state prefer it to any other kind of soil for flax.

If the land which is intended for flax be stiff, great care should be taken not to till it when it is wet, for fear of kneading it.

If the ground on which flax is to be raised has been long in tillage, it should be ploughed deep before winter, and laid up in very high ridges, in order that the winter's frosts may the more effectually moulder or loosen it.

In the month of February, if the land be not too wet, some very rotten dung should be laid in the furrows, and immediately covered over. In March, for southern countries, or in the beginning of April, where the climate is colder, another ploughing should be given to lay the land smooth, the clods should be broken by hand, or with the spiky-roller, and the seed should then be sown and harrowed in with a light or bush-harrow, so as not to bury it above an inch deep. If the soil be moist and cold a little pigeon's dung may be sown with the seed, for it agrees admirably well with the flax: but this must not be done if the ground is very light and too dry. It will also be right to lay wet land out in beds thirty or forty feet wide, separated by deep trenches, to drain off the water, and convey it into the surrounding ditches.

Most of our linseed is brought from the North, namely, from Riga and Zealand: but we may ourselves raise it very good, by conforming to the directions here given.

Linseed is reckoned good when it is large, oily, heavy, and of a bright brown colour. To know whether it be oily, a few grains of it are thrown into a red-hot fire-shovel, and they in that case crackle almost instantly and blaze briskly. If it is sufficiently heavy, it will sink to the bottom of water; and to judge whether it be new, a number of seeds exactly counted should be sown on the end of a hot-bed, and notice taken whether they all grow.

When the goodness of the seed is known, more or less of it is to be sown according as the husbandman intends either to raise a quantity of linseed for sowing, or to have very fine and soft flax. In this last case, the seed should be sown pretty thick, in order that the plants may rise the closer together, and by that means grow slender and tall, which adds much to the fineness of the fibres of the flax. If the linseed is sown with an intention to let the flax remain for seed, a much less quantity of it should be used, that so the plants may come up thin, and thereby have room to grow to their full vigour and extent. As strong soils should be chosen for this purpose, it may perhaps be most advisable to follow the example of the judicious M. de Chateauvieux, in sowing it in drills, and horse-hoeing the intermediate spaces. He observed in his experiments, that the plants of flax thus raised yielded great plenty of excellent seed.

Some sow, with their linseed, either annual or perennial grass-seeds, when they intend to lay the land down for pasture after the flax is taken off. The plants grow but weakly under the flax, which, however, they do not hurt; but as soon as the flax has been pulled, they increase apace, to the great benefit of their owner.

Flax is sometimes damaged by insects when it is about three or four inches high. It is said that they may be destroyed by a slight strewing of soot, ashes, &c. At all events, it is certain that this dressing will give vigour to the flax, though it should not kill the insects.

If any weeds appear among the flax, as is almost always the case, they must be thoroughly rooted out; and that the flax may be as little damaged as possible in the doing of this, the weeders should work bare-footed: they may indeed sit down upon the flax, for sitting upon it is found not to hurt it; but it would be greatly injured, if not killed, by being trod upon with the heels of shoes.

The finest flax is most liable to be laid, particularly in countries subject to storms. To guard against this accident, some people run across their flax field slender poles fixed to stakes: but a better method, and which is practised by the ingenious gentleman who directs the cambrick manufactory at Winchelsea, is, to run small ropes across the field, both lengthwise and breadthwise; for these, being fastened where they interfect one another, and supported by stakes at due distances, form a kind of netting, which is proof against almost every accident that can happen from tempestuous weather.

Opinions are divided in regard to the degree of ripeness at which it is best to pull flax. Some think it should be pulled whilst it is green, in order that its fibres may be the softer and finer. Others, with the same view, pull it up before its seeds are quite formed; and others again think, that it should not be pulled till some of the capsules, which contain the seeds, have begun to open, being of opinion, that the fibres of green flax are too tender, and that they fall into tow. On the other hand, it is certain, that the fibres of flax which has stood till it is very ripe, are always stiff and harsh, that they are not easily separated from the reed, and that they do not bleach well. Here, therefore, as in most other cases, both extremes should be avoided; and it consequently seems most reasonable to think, that the properest time for pulling flax, is when its stalks begin to turn yellow, when its leaves begin to fall, and when its seeds begin to be brown.

As

As soon as the flax is thought to have attained a due maturity, it is pulled generally by handfuls: but as it is seldom all of an equal degree of ripeness, or of an equal degree of strength, it would certainly be advisable to pull first the ripest and strongest plants, and then the weaker and less ripe; for by this means they would at once be separated, which is of essential importance in the watering, because the weak and green flax requires much less steeping than the stronger and more ripe. All weeds, and the earth which adheres to the roots of the plants, should be carefully taken away, and then the handfuls of flax should be laid regularly on the ground.

The author of the judicious letters concerning flax, in the Dublin Society's Weekly Observations, seems to direct a too great degree of ripeness of the flax when it is pulled, and assigns as a reason, that it does not otherwise stand the force of the mill for scutching it. But as it has been found by experience, that the force of that mill is too great, and as a better method of performing this operation, in which the force can be suited to the strength of the flax, will soon be published, this great degree of ripeness will become the less necessary.

As the flax is pulled, it is laid together by handfuls, with the seed ends turned to the south. These handfuls should neither lie quite in a line with each other, nor directly across, but a little slanting upwards, so that the air may easily pass through them. Some, instead of this method, tie the handfuls of flax loosely at the top, then spread out their roots, and thus set several of them together upright upon their roots. In either of these ways, the flax is generally left twelve or fourteen days in the field to dry it. This drying is certainly not necessary for the rippling, because the ripple will separate the capsules from the flax as effectually before it has been dried, as it will afterwards; and if it be done with a view to ripen the seed, it should be considered, that the flax will be more hurt by the longer time of steeping, which will become necessary in consequence of this drying, than the seed can be benefited; because the more the membrane which connects the fibres to the reed is dried, the greater must be the degree of putrefaction necessary to loosen and destroy the cohesion of this connecting membrane: the finer parts of the flax itself must necessarily be destroyed by this degree of putrefaction; and if the putrefaction does not arise to such a degree as to destroy the cohesion of this membrane, the fibres of the flax will adhere so strongly to the reed, that the force necessary in scutching will prove equally detrimental to the flax. The practice in some parts of Brittany, as we are informed by the Memoirs of the Society of that province, seems therefore much more rational; and this is, to ripple the flax after it has lain in the air two or three days: but even one day will be sufficient if the weather is dry.

If any flax is raised on purpose for seed, or if, through the dryness of the season, or the badness of the seed that was sown, the flax is come up very thin, so as manifestly to shew, that the seed which it may produce will be more valuable than the rest of the crop; in either of these cases, the flax should be let stand till its seed is perfectly ripe; thus sacrificing the flax itself to the then greater advantage of having good seed.

In order to ripple the flax, which is the next operation, a large cloth should be spread on a convenient spot of ground, with the ripple placed in the middle of it. The manner of performing this work is so well known, that there can be no need to describe it here. Its purpose is to obtain the linseed, which is always of considerable value, even though the flax has been pulled before its perfect maturity.

After the flax has been rippled, the seeds thereby obtained should be spread in the sun, to dry. Those which separate from the pods of their own accord are the fullest and ripest, and should therefore be set apart for sowing, in case the precaution of raising some flax purposely for seed has not been attended to. The pods, or capsules, are then broken, either by treading, or by threshing, in order to get out the remaining seeds, the whole of which, as well as the former, should be carefully sifted, winnowed, and cleaned. When the seed is laid up, it must be frequently stirred, or ventilated, to prevent its heating. Even this second seed affords a considerable profit, by the oil which it yields, and also by being used, when broken, for fattening of cattle. The cakes of linseed, after the oil has been pressed out of them, are likewise found to be useful for this last purpose, though they are thought to render the fat of cattle yellow; for which reason it is advised not to give them till within a few weeks before the beasts are to be killed. Their utility as a manure has been already mentioned.

As soon as the flax has been rippled, it should be carried with all convenient speed to the watering place. If care has not been taken before to separate the different kinds of flax, that separation must now be made; because, otherwise, some of the flax will be rotted in the water, before the rest will be sufficiently steeped.

The choice of the water for steeping it in is thus very properly pointed out in the Directions for raising Flax, published by order of the Commissioners and Trustees for Fisheries, Manufactures, and Improvements, in Scotland.

"All flax ought to be watered in canals, which should be dug in clay ground if possible, because that soil best retains the water: but if a firm retentive soil cannot be got, the bottom or sides of the canal, or rather both the bottom and sides, may be lined with clay; or, instead of lining the sides with clay, which might fall down, a ditch may be dug without the canal, and filled with clay, which will prevent both extraneous water from entering, and the water within from running off.

"A canal of forty feet long, six broad, and four deep, will generally water the produce of at least an acre of flax.

"It should be filled with fresh soft water from a river or brook, if possible, two or three weeks before the flax is put in, and exposed all that time to the heat of the sun. The greater way the river or brook has run, the softer, and therefore the better, will the water be. Springs, or short runs from hills, are too cold, unless the water is allowed to stand long in the canal. Water from coal or iron is very bad for flax. A little of the powder of galls thrown into a glass of the water, will immediatly discover if it comes from minerals of that kind, by turning it into a dark colour, more or less tinged in proportion to the quantity of vitriol contained in it.

"The canal ought not to be under any shade, because this, besides keeping the sun from softening the water, might render some parts of the canal cooler than other parts, and thereby make it water the flax unequally.

"The flax raiser will observe, that, when the water has been brought to a proper degree of heat by the sun, small plants will rise quickly in it, numbers of small insects and reptiles will generate there, and bubbles of air will rise up to its surface. If no such signs appear, he may conclude, that the water is not warm enough, or that it is otherwise unfit for flax."

Running water is not proper for steeping flax, because it prevents that degree of putrefactive fermentation which is necessary to separate the fibres from the reed; and besides this, in such streams, the flax is apt to be carried away by sudden floods, or to be filled with the mud and slime which those floods bring with them: but to have a small rill of water pass through the steeping place is very advisable, because it will supply the loss of that which is evaporated. Stagnant water, which is naturally of a bad colour, should likewise be avoided, because this communicates to the flax a colour which is not afterwards easily got rid of.

The flax, after it has been rippled and sorted, as before mentioned, should be tied very slack, with a band made of a few stalks, in bundles not larger than a man can easily grasp with both his hands, in order that the water may the more easily and more equally penetrate through them; and in this condition they should be put into the canal, somewhat sloping, or even half-standing upon one end, which, say the Edinburgh directions, should be the seed end, and consequently the root end uppermost; because, add they, (though I do not find it at all noticed by any other writers on this subject) when the seed ends are uppermost, there frequently breeds a great deal of vermin, destructive of the flax, and this, they assure us, is effectually prevented by putting the seed end downmost. However this may be, the flax, when put into the water, should be covered with straw, or fern, upon which a wicker hurdle and some stones may be laid, to keep it down, but without preſſing too hard againſt the bottom. It is a common opinion, that if the flax is not thus covered, the ſun will diſcolour it, even though it be quite covered with water.

More or leſs time is requiſite for the ſteeping of the flax, according to the nature of the water, the heat of the air, and the greater or leſs degree of woodineſs of the flax. It is ſteeped ſooner with a ſouth than a north wind; and that which has been pulled green is alſo much ſooner ſteeped than that which has been pulled when very ripe: conſequently it is not poſſible to fix any preciſe length of time during which it ſhould remain in the water. The way to know whether it has been ſteeped enough, is to draw a few ſtalks from out of the middle of the heap, and then try it: if the reed ſnaps ſhort, without bending, and if the bark parts eaſily from the reed, towards its point, the hemp has been ſufficiently ſteeped, and it muſt, in this caſe, be ſpeedily taken out of the water, for otherwiſe it will ſoon become too tender, and begin to rot.

In ſome countries, the flax is ſteeped but four days, at the end of which it is taken out of the water, and the little bundles, or handfuls, into which it was before made up, are laid regularly ſide by ſide, till they have formed a pretty thick bed, upon which are then put planks loaded with ſtones. The flax is left in this condition four or five days, or more, according to the heat of the air; and its lying thus in a heap anſwers the intent of farther ſteeping in water: but as a great degree of putrefaction may ariſe in this operation, ſo much judgment and care are neceſſary, that I cannot think it an adviſable method.

The Memoirs of the Society, which the States of Brittany have inſtituted, upon a truly judicious plan, for the improvement of agriculture, arts, and commerce, inform us, in conſequence of an account which the duke of Choiſeuil, miniſter of ſtate in France for foreign affairs, received from the French ambaſſador at the court of Ruſſia, to whom he had written on this ſubject, at the requeſt of the ſociety, that the the Livonians uſe two ſorts of places for ſteeping their hemp and flax; that the moſt ſimple of theſe are only holes dug near the ſide of rivers, and that the flax, or hemp, watered in them (which is very like the method practiſed in France) generally ſells for from twenty-five to thirty per cent. leſs than that which has been ſteeped in the following manner.

When they would have flax or hemp of ſuperior quality, they chooſe a ſpot where there is a fall of clear water, and there make, one under another, five, and ſometimes ſix, baſons or reſervoirs, each of which is at leaſt one foot, and at moſt two feet deep. The water can either be let run from one baſon to another, or be ſtopped at pleaſure. The baſons are ſeparated by ſlight banks of clay; and in each bank is a little opening, which may be cloſed whenever it is thought proper. To prevent the ſtream from overflowing the firſt baſon, and afterwards ſucceſſively the others, it is itſelf turned a little aſide by a ſmall bank of clay, and this bank is broken down whenever the water is to be renewed in the baſons.

The Livonians put their hemp and flax firſt into the uppermoſt baſon only. At the end of two, three, or four days, they remove it into the ſecond baſon, from thence into the third, and ſo on, till they have brought the ſeveral bundles of theſe plants down into the loweſt. At each of theſe ſhiftings, the firſt baſon is filled with freſh flax, and the water is renewed in all the baſons. By this means, the ſteeping is not completed till the flax or hemp has paſſed through all the baſons, and has remained a proper time in the lowermoſt, which is the laſt. Neither the Engliſh nor the Dutch import any hemp from Riga, but what has been ſteeped in this laſt mentioned manner; whereas a great part of that which the French receive from thence, is ſuch as has been ſteeped in ſtagnant waters, in holes dug on the ſide of rivers.

When the flax is taken either out of the water in which it has been ſteeped, or from the heap above-mentioned, the bundles of it are ſpread out, like a fan, at the root end, and laid on a dry new-mown meadow, that it may dry, bleach, and become ſupple. It is there turned from time to time, and as ſoon as it is quite dry it is carried off: for otherwiſe the moiſture of the dews and graſs will have nearly the ſame effect upon it, as if it had remained longer in the water. This is evinced by the practice of thoſe, who, in ſome places, inſtead of putting their flax into water, only ſpread it on a damp meadow where the graſs is ſomewhat long, leave it there all night, and in the morning, before the ſun has dried it, gather it up in large heaps, and remove it into the ſhade, in order to ſpread it out again upon the graſs the next evening; and this is repeated till the flax is found to be ſufficiently watered. In other places, it is watered by hand during the day, and ſo let it remain conſtantly on the graſs. It is then let dry, and is afterwards houſed. But, as M. Du Hamel rightly obſerves, this method is ſo tedious and troubleſome, that, even if it ſhould, as ſome ſay it does, give a little additional whiteneſs to the flax; yet the advantage in that reſpect is ſo ſmall, as by no means to compenſate for the inconveniencies of the practice, which he therefore thinks is not adviſable in any caſe, unleſs it be when the flax, after being taken out of the water, is found not to have been ſufficiently ſteeped.

The diſadvantage of laying the flax upon long graſs, after it has been ſteeped, in order to dry it, is very juſtly pointed out in the Directions for raiſing Flax, publiſhed by order of the commiſſioners and truſtees for fiſheries, manufactures, and improvements in Scotland, when they adviſe the huſbandman by no means to follow this method, becauſe the graſs, growing through the flax, frequently ſpots, or rots it. Theſe judicious gentlemen therefore recommend ſhort heath, as the moſt preferable place for ſpreading flax upon, after it has been taken out of the water; and this the rather, becauſe, when the flax is wet, it faſtens to the heath, and is thereby prevented from being blown away by the wind, whilſt at the ſame time the heath keeps it a little above the earth, and ſo expoſes it the more equally to the weather: but grounds expoſed to violent winds ſhould alſo be avoided.

" The flax, continue they, when taken out of water, muſt be ſpread very thin upon the ground; and as it is then very tender, it muſt be gently handled. The thinner it is ſpread, the better, as it is then moſt equally expoſed to the weather: but it ought never to be ſpread during a heavy ſhower, becauſe that would waſh and waſte too much the bark, which is then exceſſively tender; though it ſoon after becomes firm enough to bear the rains, which, with the open air and ſunſhine clean, ſoften, and purify it to the degree deſired, and fit it admirably for parting from the reed: in ſhort, after the flax has acquired a little firmneſs by being a few hours ſpread in dry weather, the more rain and ſunſhine it gets, the whiter and better it will be.

" The ſkilful huſbandman, who follows this method, ſpreads his firſt row of flax at the end of the field from whence the moſt violent wind commonly comes, placing the root-ends foremoſt: he makes the root-ends of every other row overlap the ſeed-ends of the former row three or four inches, and binds down the laſt row with a rope; by which means the wind does not eaſily get below the flax, to blow it way: and as the ſeed-ends are ſeldom ſo fully watered as the root-ends, this over-laying has an effect like giving the ſeed-ends more watering.

" The flax is judged to have been ſufficiently graſſed, when it is of a clearer colour than before, when its bark is bliſtered up, when that bark parts eaſily from the reed, and when the reed is become very brittle: but no written deſcription can poſſibly here convey a knowledge of this point, at all equal to that which is acquired by experience.

" The whole of the flax ſhould be ſufficiently graſſed before any of it is lifted; for if a part be lifted ſooner than the reſt, that which remains will be in great danger from the winds.

" A dry day ſhould be choſen for taking up the flax; and if there is no appearance of high wind, it ſhould be looſed from the heath or graſs, and left looſe for ſome hours, to make it thoroughly dry.

" As a great quantity of flax can ſcarcely be all equally watered and graſſed, and as its different qualities will beſt appear at lifting it off the graſs, each different kind ſhould then be collected together, and kept by itſelf, that is to ſay, all of the ſame colour, length, and quality.

" The ſmaller the bundles are into which the flax is made up, the better they will be for drying, houſing, &c. and

and in making up these bundles, as in every other operation upon flax, it is of great consequence that all the stems be laid together as they grew, that is to say, root-ends to root-ends, and seed-ends to seed-ends.

The Livonians, say the before quoted Memoirs of the Society of Brittany, cut off the roots of their hemp, but not of their flax, when it is taking out of the steeping basons above described. They then tie the flax or hemp up in bundles about as thick as the lower part of a man's thigh. These bundles are placed upright, and supported by a stake, around which a few of the tops of their stalks are twisted, the better to secure their standing. They are left in this situation one day, to drain; then they are spread upon the grass for one or two days, and after this they are laid in heaps, and covered over with haulm, stubble, straw, or some other such like covering, to make them sweat. When the hemp or flax has sweated enough, it is laid in heaps in the shade, and there dried: but these heaps must not be so thick, but that the air may penetrate a little into them. It is on this last operation that the good or bad quality of the hemp or flax thus managed chiefly depends. Both of them may be kept two or three years, and even longer, upon their reeds, after they have been prepared in the manner above directed; and when it is intended to break them, after this keeping, they are put into an oven properly heated.

In the common way, after the flax has been grassed, it must be dried by heat, to make its reed break readily, and separate the more easily from the bark. To guard against the danger of fire, this business is frequently performed in a place distant from any other building. The caverns, or hollows under hills, or rocks, before described for drying hemp, are also very proper for this purpose.

There are two general ways of drying flax. Some place against a wall, upon uprights and cross pieces, a hurdle of which the bars are small, and about two inches asunder, and upon this the flax is spread four, five, or six inches thick: a small fire, made of broken reeds of flax, is cautiously kindled under it, and care is taken to turn the hemp from time to time, that it may dry equally in every part: the flax-dresser takes off only that part of it which is at the side of the hurdle next the wall, then pushes the rest forward into its place, and fills with fresh flax the vacancy thereby made at the fore-part of the hurdle. This operation should not be entrusted to any but a very attentive person, because if the flame should be suffered to rise too high, it would set fire to the flax. It is true, indeed, that this seldom happens; and when it does, the loss is not great, because but a small quantity of flax is laid together on the hurdle. Some say, that the smoke of the fire thus made of the broken reeds hurts the colour of the flax, and that this lessens its price when it is sold; but that the quality of the linen made of it is not at all the worse, this discolouring being easily removed by bleaching.

The other method of drying flax is by putting it into a hot oven. The Livonians make their ovens, for this purpose, either of clay, brick, or hewn-stone. Those which are built with clay, are sometimes large enough to contain eight hundred bundles at a time: but it is more common to make them for only two, three, or four hundred. They are shaped like the ovens for an army, that is to say, they are very high arched. They require no greater degree of heat, which is given with dead wood, furze, broom, &c. than is just sufficient to render the reed of the flax brittle; and the same of hemp, for the Livonians use them for both these plants, the bundles of which they set upright in them, and as soon as they take them out of the oven, they carry them to a kind of a mill, to be broken.

The Dutch build their ovens for drying flax within a large capacious chimney at the end of the building where the breakers and scutchers work. The usual dimensions of this building, which is well lighted, are, in the clear, thirty feet by fourteen; but it is sometimes larger where great business is carried on, though seldom, if ever, less. The dimensions of the oven here generally are fifteen feet in depth, ten in breadth, and five feet in height: its roof is arched, its entrance, which is just large enough to admit a man with tolerable ease, is made to shut close with a wooden door. This oven is not heated with wood, excepting at the very first; for after the workmen have begun to dress the flax, the broken reeds, and other refuse parts which are beaten off it, and swept up, suffice to continue the heat, so that each parcel affords firing for the next, till the whole is dried. The Dutch kindle the fire in the oven some hours before the day's work is over. The sweepings of the flax light easily, and the oven heats and cools again sufficiently before the breaking, and scrutching is finished. They fill it when they leave off work; and the next day when they return to it they find the flax dry and fit for breaking. The flax breaks best and most easily when it is a little warm and crisp: and consequently the working it then is cheapest and most advantageous; and accordingly the Dutch never draw two bundles together from the oven, but take them one by one as they want them. It will, perhaps, be needless to observe, that when the oven is heated, it must be well cleaned before the flax is put in; for the least spark will set the flax on fire, and this would be a considerable loss, as the ovens hold a large quantity.

An ingenious correspondent of the editors of the Museum Rusticum has given us the following directions for raising flax, as practised by the flax-raisers in Scotland.

Of the Choice of the Soil, and preparing of the Ground for Flax.

A skilful flax-raiser always prefers a free, open, deep, loam, and all grounds that produced the preceding year a good crop of turnips, cabbages, potatoes, barley, or broad clover, or had been formerly laid down rich, and kept for some years in pasture.

A clay soil, the second or third crop after being limed, will answer well for flax; provided, if the ground be still stiff, that it be brought to a proper mould, by tilling after harvest, to expose it to the winter frosts; and that a little sharp dung, such as pigeons, sheep, or horse-dung, or ashes, be spread upon the ground immediately before sowing.

All new grounds produce a strong crop of flax, and pretty free of weeds. When a great many mould heaps appear upon new ground, it answers the better for flax after one tilling.

Flax-seed ought never to be sown on grounds that are either too wet or dry, but on such as retain a natural moisture: and such grounds as are inclined to weeds ought to be avoided, unless prepared by a careful summer fallow.

Before sowing, the bulky clods should be broken, or carried off the ground; and stones, quickenings, and every other thing that may hinder the growth of the flax, should be removed.

Of the Choice of Linseed.

The brighter in colour, and heavier the seed is, so much the better: that which, when bruised, appears of a light or yellowish green, and fresh in the heart, oily and not dry, and smells and tastes sweet, and not fusty, may be depended upon.

Dutch seed of the preceding year's growth, for the most part, answers best; but it seldom succeeds if kept another year. It ripens sooner than any other foreign seed. Philadelphia seed produces fine lint and few bolls, and answers best in wet cold soils. Riga seeds produces coarser lint, and the greatest quantity of seed. Scots seed, when well winned and kept, and changed from one kind of soil to another, sometimes answers pretty well; but should be sown thick, as many of its grains are bad, and fail: it springs well, and its flax is sooner ripe than any other; but its produce afterwards is generally inferior to that from foreign seed.

Of Sowing Linseed.

The quantity of linseed sown should be proportioned to the condition of the soil; for if the ground be in good heart, and the seed sown thick, the crop will be in danger of falling before it is ready for pulling. From eleven to twelve pecks, Linlithgow measure, of Dutch or Riga seed, is generally sufficient for one Scots acre; and about ten pecks of Philadelphia seed, which, being the smallest grained, goes farthest.

The

The time for fowing linfeed is from the middle of March to the end of April, as the ground and feafon anfwer.

It ought always to be fown on a dry bed.

Of Weeding Flax.

It ought to be weeded when the crop is about four inches long. If longer deferred, the weeders will fo much break and crook the ftalks, that they will never, perhaps, recover their ftraightnefs again; and when the flax grows crooked, it is more liable to be hurt in the rippling and fwingling.

Quickening grafs fhould not be taken up; for, being ftrongly rooted, the pulling of it always loofens a deal of the lint.

If there is an appearance of a fettled drought, it is better to defer the weeding than by that operation to expofe the tender roots of the flax to the drought.

How foon the weeds are got out, they ought to be carried off the field, inftead of being laid in the furrows, where they often take root again, and at any rate obftruct the growth of the flax in the furrows.

Of Pulling Flax.

When the crop grows fo fhort and branchy, as to appear more valuable for feed than flax, it ought not to be pulled before it be thoroughly ripe; but if it grows long and not branchy, the feed fhould be difregarded, and all the attention given to the flax. In the laft cafe it ought to be pulled after the bloom has fallen, when the ftalk begins to turn yellow, and before the leaves fall, and the bolls turn hard and fharp pointed.

When the ftalk is fmall, and carries few bolls, the flax is fine; but the ftalk of coarfe flax is grofs, rank, branchy, and carries many bolls.

When flax has fallen and lies, fuch as lies ought to be immediately pulled, whether it has grown enough or not, as otherwife it will rot all together.

When parts of the fame field grow unequally, fo that fome parts are ready for pulling before other parts, only what is ready fhould be pulled, and the reft fhould be fuffered to ftand till ready.

The flax-raifer ought to beat the pains to pull, and keep by itfelf, each different kind of lint which he finds in his field; what is both long and fine, by itfelf; what is both long and coarfe, by itfelf; what is both fhort and fine, by itfelf; what is both fhort and coarfe, by itfelf; and, in like manner, every other kind by itfelf, that is of the fame fize and quality. If the different kinds be not thus kept feparate, the flax muft be much damaged in the watering, and the other fucceeding operations.

What is commonly called under-growth, may be neglected as ufelefs.

Few perfons that have feen flax pulled are ignorant of the method of laying it in handfuls acrofs other, which gives the flax fufficient air, and keeps the handfuls feparate and ready for the rippler.

Of Stacking up Flax during the Winter, and Winning the Seed.

If the flax be more valuable than the feed, it ought by no means to be ftacked up, for its own natural juice affifts it greatly in the watering; whereas, if kept long unwatered, it lofes that juice, and the harle adheres fo much to the boon, that it requires longer time to water, and even the quality of the flax becomes thereby harfher, and coarfer. Befides, the flax ftacked up over year, is in great danger from vermin and other accidents; the water in fpring is not fo foft and warm as in harveft; and near a year is thereby loft of the ufe of the lint: but if the flax be fo fhort and branchy as to appear moft valuable for feed, it ought, after pulling, to be ftacked and dried upon the field, as is done with corn, then ftacked up for winter, rippled in fpring, and, after fheeling, the feed fhould be well cleaned from bad feeds, &c.

Of Rippling Flax.

After pulling, if the flax is to be regarded more than the feed, it fhould be allowed to lie fome hours upon the ground to dry a little, and fo gain fome firmnefs, to prevent the fkin or harle, which is the flax, from rubbing off in the rippling; an operation which ought by no means to be neglected, as the bolls, if put into the water along with the flax, breed vermin there, and otherwife fpoil the water. The bolls alfo prove very inconvenient in the graffing and breaking.

The handfuls for rippling fhould not be great, as that endangers the lint in the rippling-comb.

After rippling, the flax-raifer will perceive, that he is able to affort each fize and quality of the flax by itfelf more exactly than he could before.

Of watering Flax.

A running ftream waftes the lint, makes it white, and frequently carries it away. Lochs, by the great quantity and motion of the water, alfo wafte and whiten the flax, though not fo much as running ftreams. Both rivers and lochs water the flax quicker than canals.

The flax-raifer will obferve, when the water is brought to a proper heat, that fmall plants will be raifing quickly in it, numbers of fmall infects and reptiles will be generating there, and bubbles of air rifing on the furface. If no fuch figns appear, the water muft not be warm enough, or is otherwife unfit for flax.

Mofs-holes, when neither too deep nor too fhallow, frequently anfwer well for watering the flax, when the water is proper, as before defcribed.

The proper feafon for watering flax is from the end of July to the end of Auguft.

The advantage of watering flax as foon as poffible after pulling has been already mentioned.

The flax being forted after rippling, as before mentioned, fhould next be put up in beets, never larger than a man can eafily grafp with both his hands, and tied very flack, with a band of a few ftalks.

The beets fhould be put into the canal flope-ways, or half ftanding upon end, the root-end uppermoft. Upon the crop ends, when uppermoft, there frequently breeds a deal of vermin, deftructive of the flax, which is effectually prevented, by putting the crop-end downmoft.

The whole flax in the canal ought to be carefully covered from the fun with divots; the graffy fide of which fhould be next the flax, to keep it clean. If it is not thus covered, the fun will difcolour the flax, though quite covered with water. If the divots are not weighty enough to keep the flax entirely under water, a few ftones may be laid above them; but the flax fhould not be preffed to the bottom.

When the flax is fufficiently watered, it feels foft to the grip, and the harle parts eafily with the boon or fhow, which laft is then become brittle, and looks whitifh. When thefe figns are found, the flax fhould be taken out of the water, beet after beet; each gently rinfed in the water, to cleanfe it of the naftinefs which has gathered about in the water; and as the lint is then very tender, and the beet flackly tied, it muft be carefully and gently handled.

Great care ought to be taken that no part is overdone; and as the coarfeft waters fooneft, if different kinds be mixed together, a part will be rotted when the reft is not fufficiently watered.

When lint taken out of the canal is found not fufficiently watered, it may be laid in a heap for twelve, eighteen, or twenty-four hours, which will have an effect like more watering; but this operation is nice, and may prove dangerous in unfkilful hands.

After the flax is taken out of the canal, frefh lint fhould not be put a fecond time into it, until the former water be run off, and the canal cleaned, and fupplied with frefh water.

Of Graffing Flax.

Short heath is the beft field for graffing flax, as, when wet, it faftens to the heath, and is thereby prevented from being blown away by the wind. The heath alfo keeps it a little a little above the earth, and so exposes it the more equally to the weather. When such heath is not to be got, links, or clean old ley ground is the next best. Long grass grounds should be avoided, as the grass growing through the lint frequently spots, tenders, or rots it; and grounds exposed to violent winds should also be avoided.

The flax, when taken out of the water, must be spread very thin upon the ground; and being then very tender, it must be gently handled. The thinner it is spread, the better, as it is then the more equally exposed to the weather: but it ought never to be spread during a heavy shower, as that would wash and waste the harle too much, which is then excessively tender, but soon after becomes firm enough to bear the rains, which, with the open air and sun-shine, clean, soften, and purify the harle to the degree wanted, and make it blister from the boon. In short, after the flax has got a little firmness, by being a few hours spread in dry weather, the more rain and sun-shine it gets, the better.

The skilful flax-raiser spreads his first row of flax at the end of the field opposite to the point from whence the most violent wind commonly comes, placing the root-ends foremost: he makes the root-ends of every other row over-lap the crop-ends of the former row three or four inches, and binds down the last row with a rope; by which means the wind does not easily get below the lint to blow it away: and as the crop-ends are seldom so fully watered as the root-ends, the aforesaid over-lapping has an effect like giving the crop-ends more watering. Experience only can fully teach a person the signs of flax being sufficiently grassed; then it is of a clearer colour than formerly; the harle is blistered up, and easily parts with the boon, which is then become very brittle. The whole should be sufficiently grassed before any of it is lifted; for if a part be lifted sooner than the rest, that which remains is in great danger from the winds.

A dry day ought to be chosen for taking up the flax; and if there is no appearance of high wind, it should be loosed from the heath or grass, and left loose for some hours, to make it thoroughly dry.

As a great quantity of flax can scarcely be all equally watered and grassed, and as the different qualities will best appear at lifting the flax off the grass, therefore at that time each different kind should be gathered together, and kept by itself, that is, all of the same colour, length, and quality.

The smaller beets the lint is made up in, the better for drying, and the more convenient for stacking, housing, &c. and in making up these beets, as in every other operation upon flax, it is of great consequence, that the lint be laid together as it grew, the root ends together, and the crop ends together.

Of keeping Flax after it is grassed.

Nothing needs be said here, but that if the flax is to be stacked, it should be set in an airy place, upon a dry foundation, such as pob-middings, or the like, and well covered from the weather; and if housed, the floor must be dry, and the house well aired and water-tight.

General Remarks.

Persons unskilful in flax-raising frequently neglect altogether the sorting of the flax, which ought carefully to be done at the three following different times, to wit, when pulling, after rippling, and when lifting it off the grass; the consequence of which neglect is, that very different kinds being mixed together, it can neither be watered, grassed, nor scutched equally. They neither prepare proper canals nor water. They make the beets for watering a great deal too large, bind them very hard, and compress all their lint so close together in the water, trampling it down to the bottom, and putting large stones, feals, or logs above it, that the hearts of the beets cannot be half watered, or not at all, when some of it is perhaps too much done. They frequently take it out of the water after it has been there a certain time, without examining whether it be underdone, or overdone. They lay it too thick upon the grass, and upon long grassy meadows, by which means some of it is tendered and rotted. In taking it off the field, they lay root-ends and crop-ends together, or, as is commonly called, head and thraws. Lint so managed must come out very ill in the dressing; and the fault is generally, but very unjustly, laid to the lint-mill, which must destroy what is well watered before it can clean the ill-watered part of the same handful. And thus it happens, that the ends are frequently beat away in the scutching, when the middle is not well cleaned, the ends of a beet being well watered, perhaps too much so, when the heart of the beet has scarce felt the water. Such inequality in the watering of the lint appears very remarkable as it lies upon the field, the middle of the rows then generally appearing of an higher colour than either of the ends. *Museum Rusticum, vol.* IV. *page* 453.

The famous M. Tschiffeli, of Berne, in Switzerland, has obliged the public with a Memoir on the Culture of Flax, the substance of which we shall lay before our readers.

In his directions for the choice of seed, he says, it should be of a bright shining brown colour, not flat, but thick and plump; should crackle much when cast on live coals, and should sink to the bottom almost as soon as thrown into water.

With respect to soils, this writer observes, that any may do for flax, provided it is not too wet, or too stoney, and has not too much sand or gravel mixed with it: some, however, are to be preferred, particularly black earth, neither too strong nor too light; and, in general, strong land is to be preferred to light.

To prepare grass-grounds and pastures for sowing flax, M. Tschiffeli lays down the following rules:

The land should, by the end of July at latest, be turned up in small furrows, about two inches deep. Early in the month of September, a heavy harrow should, in dry weather, be drawn over the field, in order to pulverize the soil; and the month following, if the land is not in great heart, it should have a good dressing of dung, which being first regularly spread, should, in dry weather, be ploughed in to the depth of six inches at least, with narrow furrows, leaving the field rough all the winter.

In the following spring this gentleman observes, that as soon as the ground is dry, the land should have a good harrowing; and about the middle of April, which is in Switzerland the season for sowing, it should, in dry weather, have its third ploughing, somewhat deeper than the second; and if the weather should not immediately afterwards be favourable for sowing, the land should the same day be harrowed down smooth.

When flax is to be sown on a fallow, the three usual ploughings are to be given, observing only, that every ploughing is deeper than the last; and the dung should be buried by the last, leaving it rough during the winter, and managing it as above in the spring.

When flax is sown the second year after a fallow, the land being dunged the preceding year, and in good heart, no manure will be necessary; but immediately after harvest it must be ploughed about two inches deep, to prevent the weeds from growing and impoverishing the soil. As soon as any weeds afterwards make their appearance, it must be well harrowed with heavy harrows, and about Michaelmas should be ploughed in narrow furrows, about six inches deep, lying rough during the winter season. The following spring the ridges should be harrowed down, and afterwards laid smooth with smaller harrows, being in April ploughed for the last time.

Flax, M. Tschiffeli remarks, thrives best upon land that has the preceding year borne a crop which shaded the ground, and prevented the weeds from growing; therefore good flax is seldom got after rye.

This writer very justly observes, that the quantity of seed to be sown should be proportioned to the nature and condition of the land, never less than two, nor more than three, bushels to the acre. Light land should be sown earliest, but always after the dread of white frosts is over, and never in rainy weather, or when the ground is wet: a mild day is best for this purpose, when the wind is not in the north-east, and dew may be expected in the evening.

It is best, our sensible husbandman says, to begin to plough for sowing after noon, the harrow following close at the heel of the plough. A little before sun-set, the seed is to be spread, best at three casts, and the work left in this ſtate till the next morning, when, without fail, the ſeed muſt be covered with light harrows, or ſtrong rakes. If the ſoil is rather light, and the ſpring likely to be dry, it will be beſt to roll the land; and if it was not manured before the winter, ſome very rotten dung may be ſpread after the ſeed is harrowed in, and before the field is rolled.

It is better to uſe no dung at all than that which is not well rotted: ſoot and aſhes, hogs or cows urine, are good manures for flax, or in fact almoſt any thing that will not carry weeds on to the land.

When flax is grown to the height of about four inches, it may ſafely be weeded; but the precautions taken in Switzerland on this occaſion are worth notice. There the work is carefully executed, but with as much expedition as poſſible, the weeders going bare-footed into the field, and working as much as they can, either ſitting or lying down, heaping the weeds, and carrying them away every time they leave off working. The weeders ſhould alſo, if poſſible, always face the wind, by beginning at the corner of the field to which the wind blows, as in this method the flax will riſe the ſooner; and the work ſhould never be done in rainy weather, or when the ground is wet.

If the flax is to be propped, the beſt time to do it is at the time of weeding. To prop flax is to fix ſupporters, about the ſize of a man's finger, branched a little at the top, and about three or four feet long, at the diſtance of every three feet.

Flax ſhould be pulled in dry weather, in general, when the foot of the ſtalk begins to turn yellow, though the ſeed ſhould not be quite ripe. If the crop is not all of equal ripeneſs, the ripeſt ſhould be ſeparated, as, if all were to be graſſed together, the unripe part would be rotten before the other was ſufficiently graſſed: it is alſo beſt to pull, though at one time, the longeſt ſeparate from the ſhorteſt. When it is all pulled, it muſt be ſpread on graſs-ground, or on a ſtubble, the crop-end of the ſtalk being laid to the ſouth, that the ſeed may ripen the better.

M. Tſchiffeli is of opinion, that when the quantity is large, it is beſt to ſeparate the ſeed by threſhing as ſoon as it is got in, in the following manner. The beds muſt be made pretty thick, the crop-ends of the ſtalk touching the wall of the barn; and over the feet of the ſtalks a heavy plank is to be laid, to prevent the flax from being ſcattered about in threſhing. The wall, by confining the workmen, will prevent them from ſtriking too hard, and thereby damaging the flax.

If the quantity of flax is ſmall, it may be rippled in the ordinary way, obſerving only that the handfuls be not too large. When the ſeed is ſeparated, it muſt be laid on a cloth, expoſed to the ſun for ſeveral days; and afterwards it ſhould be kept in a very airy place; but muſt be ſtirred every two or three days for three weeks. It may be kept in this condition two or three years, without the leaſt damage; but when once this ſeed is deprived of its capſule, it will ſcarcely ever keep above a year.

When the flax has been rippled, it muſt again be laid, but thinner than the firſt time, on a graſs-field that has been about a fortnight before mown, being ſpread, if poſſible, in dry years on damp ground, and in rainy years on dry land, but never on wet meadows. It muſt at this period be carefully turned every other day, if the weather is wet, or the dews heavy.

The time the flax is in graſſing, depends on the coarſeneſs or fineneſs of the ſtaple, the heat and the cold, dryneſs and wetneſs of he weather; but if, in bruiſing betwixt your fingers, the top of the ſtalk when it is dry, the harle or bark ſeparates eaſily from the woody part or boon, and this laſt is not tough, but brittle, the flax ſhould be taken from the ground, in order to be carried under cover as ſoon as it is dry.

The beſt method of drying flax for braking, this accurate writer ſays, is to dig a hollow place in the earth, two feet deep, three wide, and from twelve to fifteen feet long, lining it with ſtone, over which, at the height of about four feet, is fixed a griddle, or grating, conſiſting of ſmall poles, ſecurely made faſt to four or ſix piles, or ſtakes, driven into the ground.

The moſt proper fuel, we are told, for drying the flax, is either charcoal, or well-dried turf, as well becauſe they give an equal degree of heat, as on account of their not producing much of either flame or ſmoak.

When the workmen begin to brake the flax, they muſt go on briſkly; for it ſhould be done whilſt it is hot from the grating, and ſhould be effected by an equable motion, beginning at the crop-end.

In this manner does the ſenſible and patriotic Monſ. Tſchiffeli ſay that flax ſhould in this country be cultivated and managed; and, if we are not greatly miſtaken, the method might, with very little variation, be to advantage adopted in the Britiſh iſlands.

As different countries have different methods in cultivating the various productions of the earth in general; ſo thoſe relating to flax, in particular, are greatly deverſified. We have, therefore, given under this article every thing we thought worthy the reader's attention. The following is the method practiſed in the Mahera, a diſtrict of the county of Roſcommon in Ireland; and was wrote by Mr. John Irwin, a gentleman, who has long cultivated flax there with ſucceſs.

Of the Cultivation and Management of Flax in the Mahera.

The poorer ſort of people in the diſtrict I live in, are ſo indigent, that they are almoſt in a ſtate of ſlavery. Indeed, within theſe laſt forty years, they have much recovered from their bare and naked condition, owing in a great meaſure to the conſiderable extenſion of the linen manufacture.

Their chief riches conſiſt in their annual crops of flax, corn, and potatoes, in order to pay their rents, which they help off with day-labour; a moſt galling article to them; for, as to cattle, few of them have any, or but a milch-cow or two at moſt, which are appropriated for nouriſhing generally a numerous iſſue. The calves, which induſtry ought to be let remain with them to increaſe their funds, or to clothe their families, a rapacious landlord ſeldom wants a pretence of appropriating to himſelf. Theſe people then, from neceſſity, it is evident, muſt be perfectly verſed in the cultivation of flax and potatoes; and they would ſucceed very well as to corn, had they ſurmounted a few old prejudices reſpecting the form or make of their implements, and the methods of uſing them. It is, however, from ocular knowledge of their proceedings, in my work and their own, that what I now communicate to you is founded.

The ſoil about Oran, being ſtrong, deep, and moiſt, with a clayey loam moſtly at bottom, yields excellent flax. It is here ſcarcely ever produced immediately from the ley. The general practice is as follows: a parcel of ley land in good heart, that is, which has not been ploughed for many years, is proclaimed to be ſet to graſs potatoes (otherwiſe ſpaddane, a very miſtaken practice, eſpecially if a deep ſoil, if not to be ſanded, or if a light, if not marled, or limed, or otherwiſe manured:) for this land the poor are charged from three pounds to five pounds per acre, ſanding not always included: a moſt unconſcionable price!

They generally bargain for two ſucceſſive crops; and it is for their benefit, as alſo for that of the land, to have it ſanded, becauſe it ſtrengthens it the better to ſtand a continuation of tillage, and to come the ſooner to turf, and yield a good coat of graſs, when let back into the ley; but the ſky-farmers (thoſe who hold at rack-rents) are moſtly ſo greedy for grain, that it is with reluctance they agree to ſanding, as it abates fourteen ſhillings per acre of their price. When land that requires it is not ſanded previous to this kind of tillage, it is doing it great prejudice; but farmers are not always ſollicitous about this matter, eſpecially on ſhort leaſes.

Land properly ſet in this way ought to be ſanded at leaſt a year before ſetting, that it might have proper time to penetrate into the earth, and impregnate it with its ſalts; but they are ſuch bad farmers about me, that they ſet, ſand, and plant their potatoes almoſt at the ſame time. Even in this bad way the land ſhould be ſet and ſanded (or otherwiſe manured) at leaſt in November, and the potatoes planted the March following at fartheſt: but I have ſeen land not ſanded till March or April, and not ſowed till towards the end of May, (a palpable blunder;) yet this land has yielded a tolerable crop, owing to its great natural fertility; for the ſand becomes of little uſe, if the land is turned up ſoon after it is freſh laid on. This does much hurt in the country; for ſuch land, after it is let out from a long ſeries of tillage, (ſuppoſe fifteen years) is a long time recovering itſelf, and that which is ſpaddanized out of the ley, and not gravelled at all, unleſs of a moſt ſuperior rich kind, is doubly injured.

The potatoes ſhould be dug towards the end of October, or beginning of November at fartheſt, (froſty weather excepted) to make room for a crop of bere, or a crop of flax, the ſpring following; if for flax, the land ſhould get a deep ploughing before Chriſtmas, to benefit of the winter manure, ſuch as froſt, ſnow, air, &c. and a croſs ploughing the beginning of February; and towards the end of March, it ought to get another ploughing in the track of the firſt; then the ridges to be harrowed down as fine and as flat as poſſible, and the ſeed ſown in, and lightly covered with another gentle harrowing; for the ſeed is not apt, from any cauſe that I have obſerved, to be diſturbed in the ground.

In this ſituation it ſhould be left till June, then weeded. Some weed it when four or five inches high; but treading it ſo young hurts it; and this weeding is of no uſe, for it muſt be weeded again before pulling, eſpecially in deep chiltern countries, where weeds get a-head much more than in light gravelly ſoils. In theſe the flax is always ſhorter and finer, and the ſeed in leſs quantity; but the Iriſh ſeed, though it is often impoſed for foreign, is never ſo good: for example, the firſt year's return of foreign ſeed will produce a middling good ſort of flax, whereas the ſecond return will not. To ſow the ſeed even ſhould be moſt carefully attended to: a commonly ſkilful hand will with eaſe caſt it properly, the method being ſo well known. Sixteen pecks of ſeed, at twelve quarts to each peck, is a proper quantity for an acre of good light ſoil. In my deep grounds I have known fourteen pecks to be ſufficient.

The ſeed now much uſed in Ireland is the Plantation, but the better ſort of the Baltic or Riga ſeed I would prefer. The Dutch agrees worſt of all with our climate. The choice of it is eaſily known. The women are ſurpriſingly ſkilful in every thing that regards this plant: one of them will ſhut her eyes, put her hand into ſeveral hogſheads of flax-ſeed, and fix upon that which is beſt; but they have marks from preſſing it to oil between their fingers, ſo as to obſerve the edges, and from taſte, ſmell, and view, without requiring to make the other common experiments; whence they are ſeldom deceived; not but the merchants play them a thouſand tricks in this article, which is become very lucrative of late years, from the vaſt demands there are for it.

The heavy, pale reddiſh, or rather clear brown looking ſeed, being thick and ſhort, and oily in the feel, is the beſt. Sometimes, among ſome parcels of the ſeed, there are certain mixtures, by which predications the women immediately eſtimate the quality of it. The old Iriſh ſeed, of which quantities are ſtill ſown, is the worſt of all; the returns are extremely bad, and the flax but indifferent for uſe.

Two crops ſucceſſively are common in deep rich lands; but as flax is a great drawer, they are not the better for it, as it greatly retards their coming to graſs.

We always ſow flax after potatoes or corn, (bere) and, if proper care be taken in the preparation of the land, find it to anſwer well. How far better it may be immediately out of freſh land manured, I will not take upon me to ſay: ſome writers recommend this method; but it would never anſwer with our poor people. I have ſeldom known flax to be raiſed immediately from manured grounds: mine being rich, deep, and moiſt, and properly wrought to return a firſt crop of ſome other article, yields afterwards admirable flax. Where different ſoils can be had in the ſame diſtrict, it is needleſs to obſerve, that the richeſt and ſtrongeſt, with a clayey loam at bottom, is beſt: the nature of this plant requires ſuch, being a great drawer of the nutritive parts of the earth; but, on the other hand, there is a medium to be followed in this, as in moſt other things: land may be made too rich for flax, which will undoubtedly lodge it, that is, occaſion its prematurely lying flat to the ground: this prevents its ripening, conſequently occaſions great waſte of it, total loſs of ſeed, and what is recovered of it manufactures but indifferently, and ſtands the teſts of uſe worſe: however, there is much of this ſort ſpun into yarn by the poor, and impoſed for good on the eagle-ſighted yarn-buyer, notwithſtanding his great vigilance.

If middling good land, whether in the ley or not, be fallowed early in the ſummer, and gets the proper tilth till the March following, when it is to be ſown, there is no doubt but it will yield an excellent and abundant crop of flax. Land cannot be ploughed too often, or made too fine, for this purpoſe. Flax ought to be ſown and pulled in dry weather.

It is ripe in my neighbourhood, generally ſpeaking, not till the beginning or middle of Auguſt, and ſometimes later, when late ſown: the better ſort of huſbandmen think it is not neceſſary to ſow it earlier than Good-Friday: about that time moſt people begin.

The poor people have ſeveral marks by which they know when it is fit for pulling: the degree of brownneſs of the colour is the chief, and is a ſufficient guide to any perſon. The men and women, promiſcuouſly ranged in a row abreaſt, pull it expeditiouſly enough, eſpecially if they are a little refreſhed with ſome of the good things of this life, and lay it on the ſwarth. If there be danger of rain, they bind it the ſame evening into ſheaves, and ſtook it, putting commonly eight ſheaves in every ſtook. Here it is ſuffered to remain for ſome days, till it is ſufficiently dry to remove.

The poor, from neceſſity, proceed to manufacture it immediately, by rippling of the rows, and watering it, &c. But my method is as follows. After I let my flax ſufficiently ſeaſon in the field, ſo as to prevent the danger of heating, which deſtroys it, I draw it into my haggard, ſtack it, and thatch it well. Thus I let it remain till the next ſowing time, (March) when I ripple it and water it, and, if I have leiſure, proceed to dreſs it; if not, make it back into a ſtack, and let it lie ſo, without any hazard of danger, as long as convenient: or, (another way) ſoon after pulling, it may be rippled, watered, and ſtacked, ſo as to be ready for dreſſing the ſpring following. But I chuſe the former method, becauſe I thereby preſerve the ſeed, and ſell it, if I take a little care, equal to the foreign, which will go a good way in reimburſing me my expence: it is true, the quantity of flax will be ſomewhat diminiſhed for remaining ſo long unwatered; but then it makes ample amends in meliorating it; for I have obſerved, that the flax thus managed dreſſes and manufactures much better, and when in linen, it wears beſt. But the impatience of our Iriſh ladies, who are the conductors of this branch, from the time the flax is over ground, till made into linen, is ſuch, that they do not reliſh delays of this ſort, though infinitely the beſt method of proceeding.

For watering flax, clear ſtagnated pools or canals, or ponds, are beſt, provided there are no fiſh, as it kills them: ſprings and running waters muſt be avoided. To ſink it under water is proper, and let it lie about three weeks, more or leſs, according to the quality of the flax, and the condition of it at putting in.

About me the poor people ſtill perverſely will water it in bog holes, becauſe they think the water cannot be too ſoft, and that the banks, being unincumbered with long graſs, facilitate the drying of it.

When it is brought home (as they have no ovens) they fix a large hurdle horizontally by a ditch ſide, about four or five feet from the ground: on this they lay a parcel of flax, and underneath make a large turf fire, and keep conſtantly turning it.

They judge it fit for the brake, by rubbing a parcel between their hands, and finding the prickles to detach themſelves eaſily from the flax.

The braking is a very laborious part: it is pity that about where I live there are no engines contrived for this purpoſe, as it would ſave great expence in labour. This part of the proceſs ought, properly ſpeaking, to fall ſolely to the ſhare of the men; but the women as commonly do it, which I think very unſeemly, and ſtill more ſo to ſee a man ſcutching and hackling flax, which is equally as common with us: but the women always ſcutch mine, and I find do it beſt, as I order them refreſhment, it being merry making time, (though but ſhort) like vintage, or ſheep-ſhearing time.

The conſtruction of the brakers I need not explain; they are ſimple engines, and known to every body. The broad ſcutch is beſt, as it hurts the flax leſs; it ought to be made of well-ſeaſoned oak, to be light, that the women, who are dexterous at it, may manage it the more eaſily.

A great deal depends on the ſkill of the hackler, who ought

ought to be very expert and knowing in dividing it properly, and in arranging the sorts according to their different fineness. I have had some hacklers manage this matter so well, that out of the very tow they produced I had good linen for common use. I had other hacklers, who, instead of preparing my flax to spin to eight or ten dozen of yarn to the pound, of which it was capable, prepared it so badly, as to produce me only from four to six dozen yarn.

To the spinners we keep in our houses we generally give from thirty-five to forty shillings a year: these spin from four to eight dozen yarn; but if they spin finer, they are entitled to get a gratuity in addition, or higher wages. There are girls in plenty in the north of Ireland (where the manufacture most flourishes) who spin surprisingly fine, and many of them with both hands at once, at wheels adapted for the purpose; but scarcely any of these ever come into the parts where I live.

As to the rest, from the time the yarn is sent to the weaver, till it is brought home from the bleach fit for use, it forms a particular process in itself, and shall be communicated to the public, when more ample leisure will permit. However, before I dismiss this subject, it may not be improper to make a few detached observations to illustrate still more what I have already said.

There are various ways to know good seed, which is one of our most essential objects. First, To discover its thickness, by taking some grains, and squeezing them between the fingers, until the white edges of the inside pulp or grain are forced to appear. To estimate its goodness by its weight may be easily done, by throwing a handful into water, and if good it will sink quickly. To prove if it be oily, throw a handful on the fire, and if, as soon as it touches the coals, it burns up and crackles, its goodness may be depended on. But no seed of Irish growth, as I said before, will thrive well a second year in any of the soils in my neighbourhood; nor will the same soil answer for more than two successive seasons, without the intermediate occupation of other crops procured from manures.

As the culture of flax lays down land very smoothly and well, if you chuse to have your land let out, you may sow grass-seeds with a light roller, or busk, in some little time after your flax is in the ground: they will not hurt it; and by this means you will have a full coat of grass the same season, which otherwise perhaps would not be the case for two or three seasons, flax being a great impoverisher.

When the flax is a clear yellow, or a clear brown, something resembling a lemon colour, and begins to drop its leaves, it should be pulled; but never when it is green, though often done, which is a very destructive method, for in this case it loses considerably in quantity and quality, both with respect to flax and seed. Those who imagine pulling it green will make it yield the finer linen are mistaken: they need only consult the method of the Flemings, who suffer it to remain the longer in ground, the finer they want it to prove for their laces, cambricks, &c. Care, however, should be taken not to let it remain too long in ground, as this makes it work badly, yield bad yarn, and not bleach so well.

I have kept my flax in stack in my haggard some two or three seasons, and never found it was damaged by vermin, though I know there are preventatives laid down by some writers for this purpose.

If the season be moist, there is no stacking it with safety, till it remains unheaped a considerable time in the barn, as the least heating is certain destruction to it.

No land can be too good for flax, if the seed be duly proportioned to it. If the crop fails on a rich and strong soil, it has too much seed; for it should not be so thick, but that every stem may have the benefit of the sun and air to fortify it. *Museum Rusticum, vol.* I. *page* 5.

A short Account of the Advantages of the new Machinery for breaking, scutching, and beating Flax and Hemp, invented by Robert Mac Pherson, Assistant-Secretary to the Commissioners and Trustees for Improvements in Scotland.

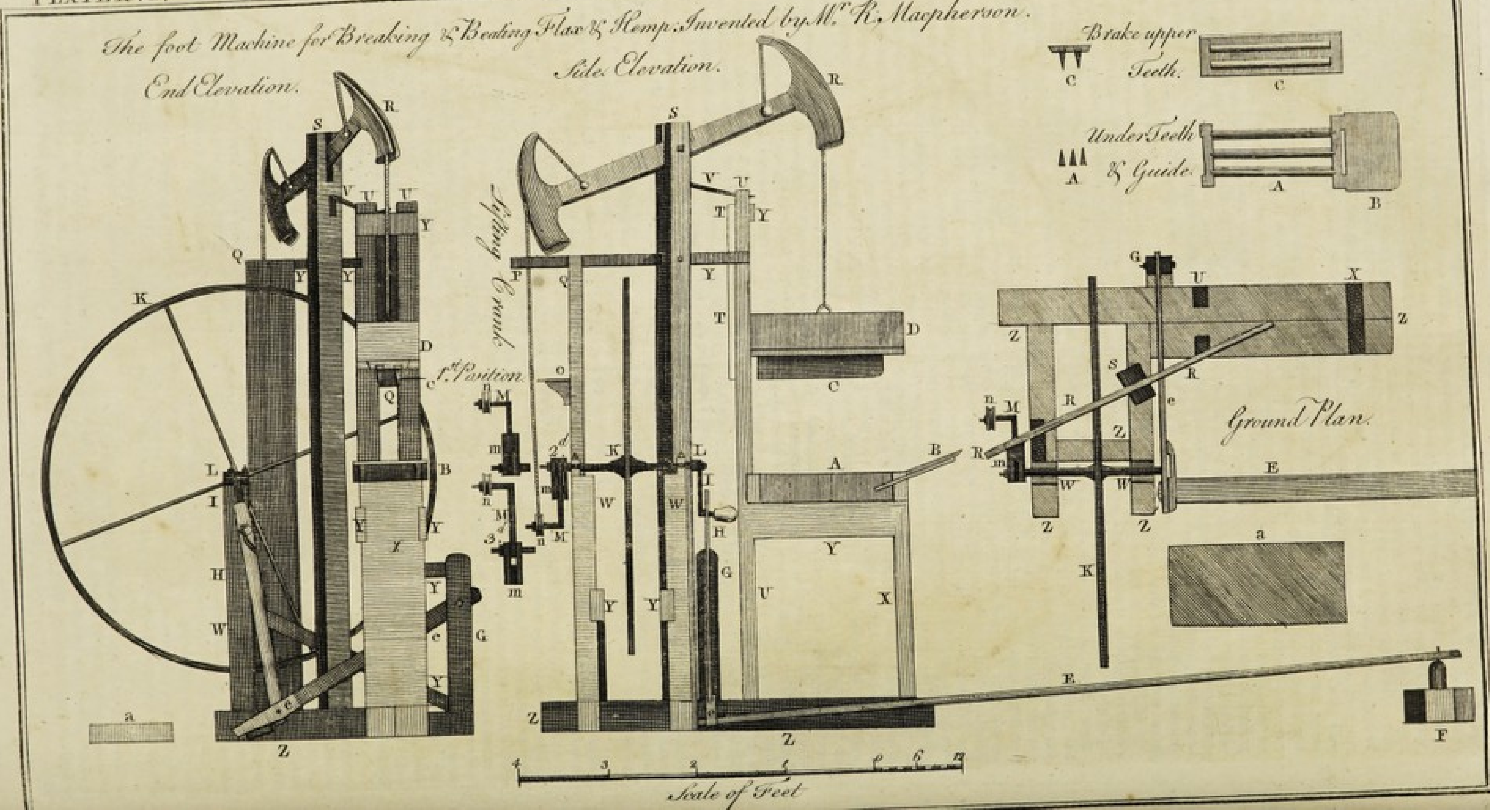
The breaking of flax by the Dutch hand-brake (which is the best old method of breaking) the scutching with stock and hand, and beating with hand-mallets, being laborious, tedious, expensive, and requiring many hands, it was thought a valuable improvement, when, some years ago, a water-mill was invented, by which these operations are performed with more ease and expedition. But in some parts of the country, a sufficiency of water and water-fall is not to be met with; in other parts where these are to be had, lint-mills are not erected, on account of their heavy expence; and where-ever erected, they are found liable to the following inconveniencies. First, The expence of fitting up the mill, making dams, the aqueduct, &c. and keeping these in repair, is great; and much damage happens by fire, and by water-floods. Secondly, In Scotland, it has hitherto been found, that on account of the scarcity of hands, and difficulty of dressing in the old hand-methods, flax never was raised in considerable quantities, until the country people found the conveniency of a mill in their neighbourhood; and therefore the first fitter up of a mill in a part of the country where there was none before, could not for years expect business adequate to his out-lay of money. This circumstance obliged the linen board in Scotland to defray part of the expence of fitting up many of these mills. Thirdly, This mill is extremely dangerous to the workmen; many have lost arms by it, some their lives, and the nature of the work there is otherwise remarkably unhealthy. Fourthly, This mill is so constructed, that the stroke of its scutchers is ineffectual, unless they are moved with a degree of violence, that nothing less than the utmost dexterity and closest care can prevent from destroying a very considerable part of the flax; and as that skill and unremitted attention cannot be expected among a number of common day-labourers, the great waste of flax always attending these mills is easily accounted for, especially as unskilful hands are often employed; for being called to this work only in winter, the lint-miller must content himself with labourers that, at the beginning of the season, are not otherwise engaged. Fifthly, The carriage of the rough flax to mills at a distance, the delay there, sometimes for months, till others be served, during which time the flax must lie without doors: damage, embezzlement, &c. these are much complained of; and, with the waste before-mentioned, have in general ruined the character of these mills. Sixthly, The expence of flax-dressing is still kept high, because the proprietor of the mill must have a large rent, especially as his outlay upon it is extensive; the miller must have a living; and the workmen extraordinary wages for such dangerous and unhealthy work. In short, it has become very doubtful, whether, upon the whole, these mills have not been more hurtful than beneficial to the manufacture.

The new water-mill for dressing flax and hemp, invented by Robert Macpherson, removes part of these inconveniencies. For, 1. It is much less wasteful of the flax; as much so, it is presumed, as water machinery can possibly be. It not only yields more flax from the scutch, but the flax dressed by it yields still more from the heckle. 2. It is fitter for dressing long hemp. 3. It is no way dangerous nor unhealthy to the workmen. 3. It requires a less expensive mill-house, and less annual repair. 5. It requires much less water. 6. For one, two, or a few workmen, the parts of its machinery which dress the flax or hemp, may be joined to the movement of a corn-mill, or any other mill, by a small iron-axle, or by rope and pully, through any wall or partition, at a side, above, or below.

Where much business in the beating way is to be done, the new machinery with water or a horse, gives entire satisfaction. But scutching proves an operation that requires more judicious management than can be expected at a public water-mill. A lint-miller, who dresses flax for others, finds his profit in the dispatch made by the great velocity which can be given to the scutchers by a power of water; but the proprietor of the flax loses more by the waste occasioned by that velocity than the miller gains by the greater dispatch. In short, the dressing of flax by any expensive public water-mill remains still liable to many of the inconveniencies mentioned in the first part of this paper.

The foot-machines (likewise invented by Robert Macpherson) it is presumed, obviate all these inconveniencies, and go far towards towards bringing flax-dressing to perfection. For, 1. They waste the flax or hemp as little as the

PLATE XVI.


The foot Machine for Breaking & Beating Flax & Hemp, Invented by Mr. R. Macpherson.
End Elevation.
Side Elevation.
Lifting Crank
1st. Position
Brake upper Teeth.
Under Teeth & Guide.
Ground Plan.
Scale of Feet

the hand methods of dressing. 2. They are much more expeditious, and as much so as dare be attempted without destroying a considerable part of the flax or hemp, which above every thing else ought to be avoided. 3. The working with them is not so laborious as the hand methods. 4. They are not dangerous to the workmen. 5. They are not too bulky for general use: they are portable upon a cart, are of small expence, simple construction, can be made by any good carpenter and smith, and each machine is wrought by a single person.

With these foot-machines any person may have his flax or hemp dressed under his own eye, by his own servants, and at times when otherwise they would be idle, in the dark afternoons of winter, when the lanthorns used by hecklers will prevent accidents by fire, and in the day-time when bad weather hinders working in the fields. Thus the dressing of flax and hemp becoming easy, the raising of these crops, of all the most profitable to the farmer, and to the country, will become more general; many will have their flax or hemp dressed by their own servants, without expence; and when others are hired to that work, the expence must be much less than by the hand methods, as the machines are greatly more expeditious. The water-mills are not taken into this comparison, because their waste of the flax or hemp overbalances the profit of their greater dispatch.

The importance of this new machinery to Britain, Ireland, and the colonies, must appear very great, when the following particulars are considered.

	l.
The value of the flax and hemp raised in England yearly cannot be reckoned less than -	250,000
It appears from the Customhouse accounts, that there was imported into England, from Christmas 1762, to Christmas 1763, 100,997 bushels of linseed. In the fens about Lincoln-Wash, thirty towns and villages have yearly about 6000 acres of flax and hemp. There are likewise some thousand acres of these crops yearly in the marsh-lands on the borders of York and Lincolnshires. The town of Snaith in Yorkshire has the greatest flax-market of any place in Britain.	
The value of the flax and hemp raised in Scotland yearly is calculated about - - - -	190,000
There is imported into Scotland about 60,000 bushels of linseed yearly.	
The value of the flax and hemp raised in Ireland yearly may be reckoned about - - - -	500,000
The linen manufacture there is about double that in Scotland, and mostly made of their own flax.	
Sum of these - - -	940,000

The expence of breaking and scutching that 940,000 pounds worth of flax and hemp may be reckoned 150,000 pounds; one half of which, or 75,000 pounds per annum, must come in time to be saved by the use of the new machines; for the new scutcher does more than double the work of the old hand-scutch in the same time. The new brake is not so advantageous in that respect; yet the inventor thinks he errs on the safe side, when he states the new brake and scutcher both together, as doing only double work.

The colonies in America are now encouraged to raise flax and hemp, by a parliamentary bounty in Britain.

The great advantages of raising our own seed, flax, and hemp, instead of providing them from foreign countries, need not be here represented. What is at present imported appears from the Customhouse accounts as follows: and it cannot be doubted but the aforesaid new machinery will be the means of increasing our own growth, and consequently decreasing the foreign importation.

	l.
The linseed imported into England is annually about 100,000 bushels, reckoned in value about - - - - - - - - - -	40,000
Into Scotland, about 60,000 bushels - - -	25,000
Into Ireland, about 80,000 - - - - -	34,000
Flax and hemp into England, about - - -	700,000
Into Scotland, about - - - - - - -	120,000
Into Ireland, about - - - - - - -	
Sum of these, exclusive of the blank for Ireland	919,000

And that there can be no want of market for an extension of our linen and hempen manufactures (which the new flax-machinery must greatly promote) appears evident from the extensive importation of these manufactures from foreign countries; for, according to the Customhouse accounts, there is annually imported into England, from the continent of Europe.

	l.
Linen-yarn, of value about - - - - -	200,000
Linen-cloth, of value about - - - - -	1,500,000
And thread, lace, sail-cloth, cordage, sacking, &c. the amount of which must also be considerable.	

Explanation of Plate XVI. *representing the* Foot-Machines *for* Breaking *and* Beating Flax *and* Hemp.

Of the Foot-Brake.

A The three under-brake teeth, or swords, seventeen inches long, three inches deep, one and a quarter inch thick at back or bottom, a quarter of an
B inch at edge, the edges two and three quarters inches asunder at the end next the guide B, and two inches asunder at the other end.

C The two upper teeth, about one inch shorter than the under teeth.

D The brake-mallet, about thirty-three pounds English weight.

E, e, A compound foot-treadle. E is eight feet four
F inches between the fulcrums, raised at F eight inches above the ground (or rather five inches higher than the stance of the workman.) e is two feet four inches between the fulcrums, and is raised
G at G eighteen inches above the ground; that is, fifteen inches higher than the stance of the workman.

H The sword or upright timber-rod which turns the wheel by the treadle-crank.

I The treadle crank, of seven and a half inches radius.

K The fly-wheel, four and a half feet diameter, above sixty pounds English weight. As here represented it is beat or cast-iron, but it is also made of timber.

L Brass cods or bushes.

M, m The lifting crank. m is fixed firm upon the axle of the fly, while the crank M, about eight inches radius, plays freely round the axle. In position first, m begins to take round the crank (which by the lever R pulls up the mallet:) when it comes to position second, the mallet is again at liberty, and by its weight pulls up the crank (faster than the fixed pieces moves) into position third.

N. B. The treadle-crank is advanced about one eighth part of the circle before the lifting crank.

a A small pulley, which turns easily round on the end of the crank, and to which a rope is fixed.

O A piece of timber which prevents the rope from falling in upon the axle, but which should not rub against the rope in its coming down.

P Here the rope passes between two friction-rollers, which are so placed that the rope comes down there four inches, or half the radius of the lifting crank, to the side of a plummet-line crossing the centre of the wheel; that is, to the side on which the crank turns when it pulls down the rope.

Q A pillar, which serves only to support the guard for the rope O, and the friction-rollers at P.

R The lever.

S The lever-pillar.

T Part of the mallet-frame.

U Two pillars which guide the brake-mallet.

V An iron spring which receives the leap of the mallet, and throws it the quicker down.

W The pillars which support the fly.

X, U The pillars which bear the brake-teeth and mallet.

Y Spur and cross, supports of the pillars.

Z The bottom frame-piece.

a A broad stool upon which the workman stands, three inches above the ground.

The brake-teeth are made of good beech or planetree, the brake-mallet of planetree, ash, elm, birch, or oak; the

FLA

the fword, or upright timber-rod between the treadle and the treadle crank, of beech, planetree, or birch; and the lever of beech, afh, or oak. The fly-wheel, if timber, fhould be made of oak, afh, beech, elm, or planetree. All the other parts of timber worth mentioning may be made of fir.

Of the Foot-Beaters.

The before-mentioned brake may at any time be converted to a beater of flax and hemp, by removing the brake-teeth, and putting in their place flat boards. In the upper of thefe boards may be driven thirty-two nails, the head about three quarters of an inch long, and the point of the head about a quarter of an inch diameter; the points of the nail-heads may be placed one inch clear afunder, and in the order marked B, at equal diftances, as in this way any of the nails may moft eafily be drawn out in repairing the mallet. An iron hoop about the mallet will prevent its burfting with the indriving of the nails.

For the fole purpofe of beating flax and hemp, the narrow end of the mallet is placed toward the workman; and where there is much work in that way, the mallet and fly may be made heavier, and then two or more workmen can work together upon the foot-treadles, which may alfo be made equally long.

Plate XVII. Fig. 1. reprefents the fcutching machine, where *b* BG is the foot-board; D, D, fcutchers; Q, the center of the iron wheel C, C, Q; S, the upright piece, or fcutching ftack; A the piece on which the hand refts in order to fcrutch the flax. The machine is put in motion by the nunch at M, which is moved by the foot-board.

We have been the more particular in our account of the various methods ufed in cultivating and dreffing flax, becaufe it is an article, which, with proper encouragment, may become of the utmoft importance to thefe kingdoms; and, therefore, we were perfuaded that we could not do a more acceptable piece of fervice to the hufbandman, than by giving the various methods at full length, though we are confcious that in doing this the reader will meet with fome repetitions, which could not be avoided without curtailing the whole, and confequently rendering it lefs valuable. It is for the fame reafon, that we think the following account of the progrefs of the flax-hufbandry in Scotland, will be confidered as a very ufeful and entertaining addition to this article.

Progrefs of Flax-Husbandry *in* Scotland.

[Written by lord Kames; and publifhed, about the middle of January, 1766, by the Truftees for Improvements.]

As the power of a ftate confifts chiefly in the number and induftry of its people, every thing muft be of importance that contributes to thefe ends. This obfervation puts the linen manufacture in a confpicuous light; for it employs many hands, and requires the moft painful induftry. In Scotland, this manufacture, which, within the memory of man, fcarce deferved the name, has of late years made a progrefs fo rapid, as to become our chief manufacture, circulating more money than all our other manufactures in conjunction. Nor is there any fymptom of its being ftationary: on the contrary, it is every year boldly advancing with wider and wider fteps.

This profpect muft be agreeable to every well-hearted Briton; and to gratify the laudable curiofity of fuch perfons, the following brief account of the progrefs of the manufacture is prefented. The board of Truftees was eftablifhed anno 1727: the value of the linen ftamped from the 1ft of November 1727 to the 1ft of November 1765, not including what was made for private ufe, was as follows. [xii. 351.]

Anno		L.	Anno		L.
1728	———	103,312	1737	———	183,620
1729	———	114,383	1738	———	185,026
1730	———	131,262	1739	———	198,068
1731	———	145,656	1740	———	188,777
1732	———	168,322	1741	———	187,658
1733	———	182,766	1742	———	191,689
1734	———	185,224	1743	———	215,927
1735	———	177,466	1744	———	229,364
1736	———	168,177	1745	———	224,252
1746	———	222,870	1756	———	367,721
1747	———	262,866	1757	———	401,511
1748	———	293,846	1758	———	424,141
1749	———	322,045	1759	———	451,390
1750	———	361,736	1760	———	523,153
1751	———	367,167	1761	———	516,354
1752	———	409,047	1762	———	474,807
1753	———	445,321	1763	———	552,281
1754	———	406,816	1764	———	573,243
1755	———	345,349	1765	———	579,227

Though the progrefs of the linen manufacture in general is not the profeffed purpofe of this paper, yet I fhall endeavour to account for it, as a proper introduction to an hiftorical narrative of the meafures taken by the truftees for promoting our flax-hufbandry.

The union of the two crowns of England and Scotland was a fatal event for the latter. The great increafe of power which our kings thereby acquired, reduced the Scotch nobility to a ftate of humble dependence. From being petty monarchs, they became flaves to the crown, and had nothing left to fupport their accuftomed dignity, but, under protection of the crown, to enflave their inferiors. The national fpirit, bold and brave, fubfided by degrees; and a general torpor fucceeded, the never-failing effect of flavery. Though reftored to liberty and independence, by the union of the two nations, yet mutual jealoufy and enmity obftructed long the advantages of our new fituation. At length the bleffings of liberty and independence became confpicuous, and invigorated multitudes to exert themfelves in laudable undertakings. And hence that fpirit for improvement in Scotland, difplayed upon hufbandry, upon manufactures, upon commerce, and upon literature.

The eftablifhing a board of truftees for directing this national fpirit, upon fifheries, and upon the manufactures of linen and woollen, was a meafure wife and political, zealoufly promoted by a worthy patriot, who was rewarded, by the opportunity he long had of ferving his country, as an eminent member of that board. His ftatue was erected in the fenate-houfe, by thofe of his own profeffion, in token of their veneration for him, as a judge above all corruption. From his fellow-citizens in general a ftatue was not lefs due, as a token of their gratitude for his patriotifm.

But whatever was his zeal for the public good, and whatever zeal he infpired into others, yet the operations of that board were not at firft attended with great fuccefs. The indolence and ignorance of the low people, and their want of honefty, could not be cured but by perfeverance and artful management. But unluckily we were at that time ill provided with political phyficians fkilled in the cure; which is always the cafe in a country where induftry is dead, and no perfon thinks of it. The truftees were forced for fome time to grope in the twilight of knowledge: they frequently miftook their road, and adopted meafures that were not always adequate to the ends propofed. But as the intendment of this paper is neither to make a fatire nor encomium upon the truftees, it fhall only be obferved in paffing, that the ignorance of this nation with refpect to manufactures, and with refpect to the means of promoting them, may well excufe the few errors committed by the truftees at the commencement of their management; and that thefe errors ought not to derogate from their merit, in ferving their country without the flighteft motive of private intereft.

The truftees, having with great affiduity furmounted endlefs difficulties and obftructions, were encouraged to redouble their diligence. The people are in a meafure reclaimed from idlenefs and difhonefty: induftry is gaining ground, and is fpreading even to diftant corners: fpinners and weavers greatly multiplied, are daily acquiring more and more fkill: many bleachfields are perfected, and the colour of our linens is much improved. Nor have water-mills been neglected for dreffing flax of our own growth; though thefe, after much expence beftowed, do not now give general fatisfaction.

Thefe expenfive articles drew great fums from the truftees; fo great, that little was left for promoting other branches. But thefe articles being now far advanced, fo as not to require much further fupport, it is the intention of the truftees, to promote the growth of our own flax with their utmoft affiduity. This appears the proper time for encouraging that capital article, becaufe a market is now provided for it, viz. a home market, which of all is the beft; and no perfon can doubt of this market, when he is informed, that foreign flax, to the amount of 110,000 l. is yearly imported into Scotland.

The faving this annual fum to the nation is not the only, nor indeed the greateft benefit that will accrue by promoting flax-hufbandry. A manufacture cannot but be upon a precarious footing, when recourfe muft be had to a foreign market for the crude materials; and a nation muft be upon a precarious footing, when it is in the power of foreigners, with a fingle fiat, to ftarve a great proportion of its people, by withdrawing from them the means of labour. This obfervation is in part unhappily verified by the prefent ftate of our flax-commerce; for foreign flax has, within thefe feven years, been gradually fo much raifed upon us, that we pay now for it fifty per cent. more than formerly. Secondly, For a further encouragement to raife flax, the farmer may be affured, that our own flax, when fkilfully managed, and the ground well prepared, is tough, compact, and fmooth; and confequently, for thread, lace, gauze, cambrick, and lawn, is better fitted than that of Holland, which generally is fpungy and cottony. Scotch flax, when brought to its utmoft perfection, may probably rival even that of Flanders. It is too good for Ofnaburgs, which require coarfe Ruffian flax. The Dutch flax is only preferable for thick hollands. Thirdly, All the labour beftowed upon foreign flax purchafed by us, in preparing the ground, in fowing and pulling, in watering, grafing, and dreffing for the heckle, is paid for by us. What a benefit to this nation muft it be, to give bread to numbers of our own people, by employing them in that work? Fourthly, As a confiderable proportion of the flax we ufe is of foreign growth, and as the heckler and the fpinner muft pay money for it, the one is difpofed to over-heckle it, and the other to draw it out into too fine yarn, in order to make the moft of their money. This evil would be in a good meafure prevented by having flax in plenty of our own growth; for the heckler and fpinner would in that cafe ufe it freely, without labouring to draw it beyond its grift.

The truftees, for thefe reafons, cannot direct their management to a more important object than to that of flax-raifing. This indeed they had early in view, though they did not always hit upon the moft effectual means. They brought flax-raifers and flax-dreffers from Holland, Flanders, and England: they publifhed directions for raifing flax: they laid out money for breeding apprentices to flax-raifing and flax-dreffing: they encouraged the erection of lint-mills; gave falaries to ftationed raifers and dreffers of flax, and diftributed heckles. The article laft mentioned did good, and continues to do good; but moft of the other articles were lefs fuccefsful than was expected, becaufe the truftees, inflamed with the fpirit of patriotifm, made a more rapid progrefs than was confiftent with the circumftances of the country. For one inftance, it feldom happens that the beft artifts are moved by the hope of greater gain to defert their native country; and therefore to fend fome hopeful young men abroad to be thoroughly perfected in the art, is a meafure more flow indeed, but always more fuccefsful. And had this method been followed, the fuperior fkill of the men thus educated, would have procured them good bread, without burdening the public fund with falaries. By neglecting this fafe meafure, there were few or no fkilful perfons that could be employed as ftationary raifers and dreffers of flax; and the truftees were forced to take up with fuch perfons as could procure the beft recommendations, which generally proceeded from interefted motives. The negligence, accordingly, and unfkilfulnefs of thefe perfons, ruined all.

One of the encouragements for flax-raifing, was a premium of fifteen fhillings upon every acre prepared for flax-feed, according to a method prefcribed. This premium was in effect putting the plough before the horfes. It indeed excited many to fow linfeed; but it was foon difcovered, and might have been forefeen, that it was no fufficient encouragement, without providing a market for the flax, when feparated from the ground. The premium was not the half of the price of the feed: the product lay upon the farmer's hand, who had neither fkill nor people for dreffing it with ftock and hand, lint-mills being at that time extremely rare; and, by thefe means, he was upon the whole a great lofer by this premium.

Lint-boors came next in play, by a hint taken from Holland and Flanders. The lint-boors there purchafed all the green lint in the neighbourhood, water and grafe it, and, in a word, prepare it for the heckle. This meafure had a fair appearance; the truftees were fond of it, and gave great encouragement for carrying it into execution. But this meafure proved abortive; and it could not happen otherwife. It was not adverted to, that the culture of flax had fubfifted in Holland and Flanders for centuries; and that confiderable ftocks were acquired by dealing in the different branches of the manufacture, part of which could not be better employed than in the lucrative trade of a lint-boor, furrounded with lint fields, that fave the expence of carriage. In Scotland every article was oppofite: the manufacture was ftill in its infancy: no provifion of fkilful hands; lint-fields were thinly fcattered; and it was a great burden upon the lint-boor to carry fo weighty a crop from a great diftance: no perfon had a ftock for building houfes, preparing canals, &c. and had there been fuch perfons, they would not have ftooped to an inferior branch, while the higher branches lay open to employ their money upon.

The water-mills, mentioned above, having a fpecious appearance, met with vigorous encouragement, and exhaufted a great deal of public money. They were favourites of the country-people, by faving labour in dreffing the flax; of which thofe were the moft fenfible who were acquainted with the flownefs and fatigue of the ftock and hand. It was not doubted but that thefe mills would incline every farmer to raife flax; and the truftees were intent to accelerate that effect. A premium was notified of eighteen-pence per ftone for dreffed flax of our own growth; which was confined to the three great linen counties of Perth, Fife, and Angus, becaufe the public fund was not adequate to a more general premium. The fuccefs of this meafure has been confiderable; and would have been ftill more confiderable, had a fufficient number of fkilful flax-raifers been provided to inftruct the country people. The demand for foreign flax has greatly fubfided in thefe counties; and in a few years will probably vanifh altogether. This premium is now transferred to the counties of Lanark, Air, Renfrew, Dumbarton, and Stirling, where it will certainly produce the fame beneficial effects; and the intention is, to carry it progreffively through the kingdom.

For the fame purpofe of promoting flax-raifing, quantities of linfeed have been diftributed, moftly in the highlands, at firft gratis, and afterward under prime coft. This meafure had a good effect; but not equivalent to the fums beftowed upon it. For the farmers were not fufficiently fkilled in preparing the ground: and they were not fufficiently anxious to be inftructed, becaufe they put little value upon feed which they got for nothing, or at a low price.

To remedy this evil, and to excite a fpirit of cultivation, large premiums were given for the greateft quantities of flax produced upon an acre. This inflamed the induftry of the farmer, and had the effect of procuring very rich crops. Some farmers became expert in high dreffing for flax-feed, and every one was fond to receive inftruction; which was the great object of the premium. And yet the truftees were forced to drop this premium, though with great reluctance, before the effect was completed. Induftry was not fo far advanced as to have reclaimed entirely the labouring poor from trick and deceit. The premiums were confiderable; and if, upon the one hand, they promoted good hufbandry, they, on the other, were a temptation to practife fraudulent methods for obtaining falfe reports of the quantities of flax produced. Such frauds are infectious; and the truftees faw no other means to prevent the infection, but to withdraw the bounty altogether. There is no reafon, however, to repent of having fet this meafure on foot; for tho' it may not have had the complete effect intended, it has undoubtedly promoted fkill in flax-hufbandry, and has alfo given fufficient evidence to the flax-farmer, that plentiful crops can be produced by high cultivation.

To proceed in the hiftory of water-mills, experience difcovered that they were attended with many inconveniencies. The labour of carrying rough lint to thefe mills from a diftance, came to be felt; as alfo the delay of getting the lint dreffed, when the mill happens to be much employed. At the fame time, the ordinary yield of this mill in dreffed flax, is fo much inferior in quantity to that of ftock and hand, as to over-balance fully what is faved upon labour; not to mention the hurt that is done to the flax by the violent and ill directed action of the mill. But the worft of all is, that the lint-miller, being under no check nor controul, is tempted to defraud his cuftomers of part of their dreffed flax: and there are inftances where the whole has been with-held from poor people, who it was thought would not have courage to bring a law-fuit. In many places there is not fufficient houfe-room provided for the flax that is brought to the mill: which, in a bufy time, is often expofed to the air for months together before the miller can reach it. By thefe means, many lint-millers, I am far from faying the whole, are fo funk in their credit, that the farmers in their neighbourhood, rather than fubmit to the foregoing hardfhips, chufe to abandon flax-raifing altogether.

It is peculiarly lucky for Scotland, that, during this diftreffing fituation, a flax-machine has been invented, that promifes not only to remedy the faid inconveniencies, but alfo to advance flax-dreffing to its perfection, with no lefs frugality than expedition. It is wrought by a fingle hand, takes up little room, is portable in a cart, and fo little expenfive, that three or four neighbouring farmers may have one in common for a meer trifle contributed by each. Its motion, at the fame time, is fo eafy, and fo much under command, that it is equal to ftock and hand with refpect to the yield of dreffed flax, and alfo with refpect to the gentlenefs of its motions. And taking into the account the expedition of this machine, which performs at leaft thrice the work of ftock and hand, it muft be pronounced a happy invention.

But we have not exhaufted all that can be faid in its favour, nor indeed the greater part. It is a capital advantage, that by it the farmer can fuperintend the dreffing his flax without hazard of being cheated; and, what is ftill more, to get his flax dreffed without a farthing of charge; which may be done by the following method. The flax is generally watered and grafed before the corn-harveft, or at leaft before the bufy time of it; and therefore may be done by the farm-fervants, without interrupting other work. The flax may be houfed at the end of a barn, or other convenient place, till winter, when the farm-fervants, for want of light, are laid idle for fome hours in the afternoon. During this time, the farmer and his fervants cannot be more profitably employed than in dreffing their flax; and the long nights afford more than fufficient time for dreffing all that will be raifed by a knot of neighbouring farmers. And even fuppofing the fwifteft progrefs of lint-hufbandry, every farmer may afford to purchafe a machine for his own ufe folely, which may be employed, not only during the dark hours of the afternoon, but frequently in day-light, when bad weather forbids all field-operations.

It is difficult, I am fenfible, to entice people to employ in labour their accuftomed idle hours; but addrefs and perfeverance will conquer many difficulties. And to operate this converfion of idlenefs into labour, there is one means among many that cannot fail of fuccefs. An article is commonly ftipulated by farm-fervants as part of their wages, which is, to have ground allotted them for fowing fome lint-feed. They are generally put off with the worft foil, ill prepared: their crops are fcanty: the expence of dreffing unconfcionable: and ftating every article by a juft calculation, lint purchafed at a market would come cheaper to them than what they thus procure. To engage them to work at the machine, no more is neceffary but that the farmer take them in as partners. He has, for example, one hogfhead of linfeed; they another among them. Let it be all fown promifcuoufly in the fame field; upon which, for his own fake, the farmer will beftow the higheft dreffing. It is watered in common, grafed in common, and dreffed in common. When a divifion is made in proportion to the quantities fown, the poor labourers will rejoice in a double increafe, purchafed with a little additional labour, without any expence. Far from grudging this labour, their convening together in one place, with a fire for drying the flax, will afford them high amufement. Their labour will be eafy, being divided among many hands, and it is fit that the farmer encourage them by taking part in the labour. A little care, at the fame time, with proper lanterns, fuch as are ufed in heckling, will remove all hazard of fire; efpecially if the farmer himfelf take a narrow furvey every evening when the fervants leave off work.

Though the dreffing of flax by this machine requires not more fkill than by ftock and hand, yet to fhow the management of it, particularly the dexterous handling of the flax, and to inftruct the country people in the preceding articles of chufing and preparing ground, weeding, pulling, watering, and grafing, it muft be of confequence that the truftees educate and employ in different parts a number of itinerants. This method of having the flax dreffed by the country fervants in their otherwife idle hours, is far fuperior to that of lint-boors, even fuppofing we were ripe for thefe artifts; becaufe by no other means it is poffible to get flax dreffed without expence, and indeed without any labour that can be reckoned upon. The expence of dreffing has hitherto been a bulky article; and confidering the wafte occafioned by water-mills, is perhaps not under forty per cent. of the flax; all of which may be faved by the machine under confideration.

Though few of the meafures laid down by the truftees for promoting flax-hufbandry, have correfponded to the fanguine hopes at firft conceived of them; yet thefe meafures, imperfect as they were, contributed confiderably to the improvement of flax-hufbandry, which is farther advanced than is commonly thought. The value of flax annually produced in Scotland, after it is heckled, and ready for the fpinner, may be pretty nearly afcertained as follows: The value of linen cloth now made in a year, amounts to about 700,000 l. the value of the thread manufactured in a year cannot be lefs than 100,000 l. we are more uncertain about the quantity of the linen yarn exported; but we cannot be far wrong in ftating it at another 100,000 l. and thefe articles amount in whole to 900,000 l. The next point is to afcertain the value of heckled flax ufed in thefe different articles. Taking all the different kinds of linen cloth at an average, the value of the heckled flax may be about a third; and the proportion is rather more in thread. Of the yarn exported, the value of the flax cannot be much below the half. Joining thefe particulars together, the value of the heckled flax annually manufactured in Scotland amounts to 316,666 l. Subtract the value of the flax imported, and the price of heckling it, which is performed at home, computed to 125,000 l. the remainder, 191,666 l. or 190,000 l. in round numbers, is the value of the heckled flax from our own growth.

The purpofe of this paper is, to encourage landholders and farmers to apply vigoroufly to flax-raifing, which, from what is faid above, will appear equally beneficial to themfelves and to their country. The truftees ftruggled at firft with many difficulties; the ignorance, the idlenefs, the indocility of the people. But happily thefe difficulties are in a meafure furmounted. There are not wanting hands expert in raifing and dreffing flax; and the truftees are bent upon increafing their number. To deal in this article, the encouragement muft be great, when there is a market at home; and there muft always be fuch a market while importation continues. The late premiums for the greateft quantity of flax upon an acre, have fpread the art of preparing land for flax-feed; and reiterated experiments of the great produce of flax from high dreffing, muft roufe every farmer. The bounty of eighteen-pence per ftone for dreffed flax, though limited to a few counties, will in time make its progrefs through every county; and farmers, if they regard their intereft, will early prepare for receiving the benefit of this bounty when it reaches them. But of all encouragements for flax-raifing, that of the new machine is in reality the greateft; by preventing a great wafte of flax, by refcuing farmers out of the fraudulent hands of lint-millers, and by faving an endlefs expence formerly laid out for bringing lint to the heckle. In ufing this machine, a farmer fuperintends the dreffing his own flax; it is done by his own fervants when they cannot be otherwife otherwiſe employed; and it is done without expence. A crop of flax, of all the moſt lucrative, will by theſe means pay a conſiderable part of the rent, and make quicker returns of money than moſt other crops. Nor ought it to be overlooked, that the finding employment for ſervants when they would otherwiſe be idle, comes to the ſame with leſſening their wages. The truſtees will diſperſe a few of theſe machines *gratis* in different quarters to ſerve as models. The machine is of eaſy conſtruction, and can be correctly copied by any good workman.

It is zealouſly to be wiſhed, and may reaſonably be expected, that the flax-raiſing will be greatly promoted by this machine, and will creep into every corner. But there is ſomething ſtill wanting to complete the encouragement; and that is, a ready market for the flax when it is prepared for the heckle. To that end the truſtees will conſider whether it may not be proper to appoint lint-markets in certain counties, where buyers and ſellers may reſort: and to proclaim premiums for the greateſt quantities of flax brought by individuals to theſe markets: and we cannot copy a better model than the premiums given for improving the ſtaple of our wool; a regulation that has a fine effect. It is ſubmitted, whether it may not be proper to begin with appointing three or four markets within the five weſtern counties which at preſent enjoy the bounty of eighteen-pence per ſtone for home flax; becauſe frauds that may be committed in claiming the propoſed premiums, will be eaſily checked by the itinerant raiſers and dreſſers of flax appointed for inſtructing the people in theſe counties. The truſtees will alſo conſider, whether it may not be uſeful to proclaim at the ſame time flax-fairs in central places of other counties, aſſuring the inhabitants of the premium in their courſe.

Having diſcuſſed flax-raiſing, we ſhall ſubjoin an appendix regarding the linen manufacture in general. As this manufacture is now advanced much beyond what is neceſſary for our own conſumption, it is the duty of the truſtees to attend to the commerce of that commodity, and to uſe their endeavours to put it upon the beſt footing. To form a ſolid judgment upon this important ſubject, one muſt be previouſly acquainted with the manner in which that commerce is carried on at preſent; a brief view of which is as follows: London is our capital market: our linens are conſigned to factors who ſell upon time; to them it is of little conſequence what the price be, or whether punctual payment be made, becauſe they remit only what money they receive: commiſſion and other charges are ſubtracted; which, with ſlow payments, is a grievous burden upon the dealers in this country. Of a commerce carried on in this manner, the natural and neceſſary effect with reſpect to the dealers here, is to confine it to thoſe who have large ſtocks, and can afford to lie out of their money. This ſtate of our linen-commerce muſt cramp the manufacture exceedingly: it is in effect a monopoly, and a monopoly of the very ſtricteſt kind, confining manufacturers to the wholeſale-dealer who lives among them, or in their neighbourhood; for to try all the dealers where a ſingle web only is to be ſold, would be a great waſte of time, with little proſpect of a better price. There are, it is true, ſome petty dealers engaged in this commerce, known by the name of hawkers, who afford to the weaver ſome ſlight relief againſt this ſlaviſh dependence. Theſe men lay out their ſmall ſtocks in picking up linen cloth as it comes from the loom; which they alſo muſt ſell to the wholeſale-man, for they cannot afford to deal directly with London. But being better able than a weaver with a ſingle web, to cope with the wholeſale-dealers, and having more knowledge of the trade, they generally obtain a more equal price, becauſe they can change about if they be ill treated. Hence it is, that theſe hawkers are no favourites of the wholeſale-men; which remarkably appeared in an application to the board of truſtees, inveighing bitterly againſt hawkers, and calling forth the vengeance of the board upon them as deſtructive to the manufacture. It was poſſibly imagined, that the truſtees might have overlooked a maxim of which none are ignorant, viz. That the more numerous purchaſers are, the better for the manufacture. But this incident may juſtly give reaſon to apprehend a combination among the wholeſale-dealers to deſtroy hawkers: an agreement not to purchaſe from them, or to keep down the price, will produce that effect; and, by this ſimple means, the whole trade may be monopolized by the great dealers without a competitor.

The plan that bids the faireſt for putting this commerce upon its moſt advantageous footing, is, that there be four linen fairs held annually at Edinburgh, as the moſt central place, each of them to continue four or five days; which will naturally produce a conſiderable circulation of ready money, and conſequently afford the poor manufacturer ſome inſtant relieve for carrying on his buſineſs. We indeed can ſcarce hope for commiſſions from wholeſale-merchants in London, who have linen-drapers at hand to furniſh them goods for completing their aſſortments. But an inſtance ſomewhat ſimilar, gives encouragement to hope that other Engliſh dealers may reſort to our fairs. When the commerce of black cattle was laid open by the union, our people carried their droves to England: but expence of travelling, and fluctuation of markets, made this a precarious and hazardous commerce, and reduced to bankruptcy many of our drovers. At length the proſpect of choice and cheapneſs at a public market, drew down to this country the Engliſh dealers; and now the greater part of our cattle are ſold at home for ready money. What reaſon have we to doubt, but that the Engliſh dealers will reſort to our fairs for linen, as they do for cattle? There is no reaſon to doubt, provided we perform our part; which is, to be induſtrious in advancing our linens to their perfection. Our ſituation for ſuch fairs is undoubtedly better than that of Ireland: for, ſuppoſing other articles equal, an Engliſh dealer, unaccuſtomed and averſe to ſea-voyages, will never prefer a perilous navigation before a ſafe and ſnug journey upon *terra firma*.

The trouble and expence of carrying home goods that remain unſold at a fair, have ſuggeſted a linen-hall, as a repoſitory for ſuch goods, where dealers may be provided during the interval between two fairs. But as it is difficult to foreſee the fate of any new project, the truſtees, ſenſible of former diſappointments, will probably be diſinclined to adopt any expenſive plan for a linen-hall. It is the ſafeſt courſe to be frugal in making the experiment: ſucceſs may encourage them hereafter to be more bold.

One capital view of the plan propoſed, which can ſcarce fail of ſucceſs is, to reſcue the poor weavers from the oppreſſion of the wholeſale-dealer, by affording them a choice of markets. If the price offered by their neighbour, the wholeſale-man, be not thought ſufficient, a number of them clubbing together may ſend their goods to an Edinburgh fair, under the care of one of themſelves, or of any truſty perſon. This plan will be a ſignal bleſſing to the hawkers in particular: it will enlarge their field of action; it will make them independent; and it will augment their number: than which nothing can be more beneficial to the manufacturer. Every web is picked up as it comes from the loom, with a view to ſome little profit at an approaching fair; and in ſo ſwift a circulation, a very ſlender profit will content a hawker. This plan will be equally convenient for pedlers, who, inſtead of painful journies through the country to make up their aſſortments, find at hand, in a fair, every ſort they have occaſion for. Nor need we be diffident of commiſſions from Glaſgow, Liverpool, and other trading towns on the weſt coaſt; becauſe the dealers in theſe towns will find themſelves cheaper ſerved here than at London.

Theſe effects of the plan are obvious at firſt view. But there appear other good effects, ſome more, ſome leſs extenſive, that caſt up upon further conſideration. In the firſt place, frugal perſons, who purchaſe for their own uſe, will undoubtedly reſort to the public market, becauſe ready money will afford them both choice and cheapneſs. Secondly, Buyers and ſellers coming to be mutually acquainted, the reputation of the beſt artiſts will procure them private commiſſions for all the linen they make. Thirdly, Theſe fairs will be a great means for improving the fabrick of our linens. At preſent there is little opportunity for a comparative trial; but here manufacturers will ſoon be made ſenſible that they have little chance to vend their goods if the fabrick be in any degree imperfect. Laſtly, The quick circulation of money produced by theſe fairs, will enable the manufacturer to vend his goods at the loweſt price; and the current price for ready money being

being thus fixed, muſt have the effect to regulate in ſome meaſure the bargains that are made upon time.

Every one who gives attention to what is paſſing in the world, muſt perceive the importance of the linen manufacture to Scotland. Like a ſtone rolled halfway uphill, it muſt be puſhed to the ſummit, or it will fall to the bottom, and involve all in ruin. Honeſt labour and unrelenting induſtry will puſh this manufacture to the ſummit, and produce a moderate degree of opulence, with its never-failing attendants, plenty and population. Opulence ſo acquired, being diſtributed through every vein of the politic body, ſerves to animate every member. May heaven avert from our thoughts the ambition of acquiring wealth independent of labour and induſtry; for profuſe wealth, being always unequally diſtributed, never fails to ſap the foundations of virtue, to erect a throne for luxury, and for depraved ſelfiſhneſs, which reduce a nation to an abject ſtate of degeneracy, and terminate in a total corruption of manners.

FLAYL. *See* FLAIL.

FLEABANE, or *Fleawort*, the name of a pirennial weed common in paſtures, the ſtalk of which is round, bending, ſolid, and hearty. The leaves are oblong, ſharp-pointed, wrinkled, downy, and embrace the ſtalk on which they grow very thick without any regularity. The flowers are yellow, radiated, and incloſed in a flower-cup, made of narrow ſcales like briſtles.

FLEAK, a gate ſet up in a gap.

FLEAWORT. *See* FLEABANE.

FLET-MILK, milk that has been ſkimmed, or had the cream taken off.

FLOATING *of Meadows*. *See the article* MEADOW.

FLOTE-FESCUE graſs, an excellent graſs for cattle, growing in watery places.

The flote-feſcue affords excellent feed for horſes. Mr. Stillingfleet, quoting a piece publiſhed in the Amæn. Acad. Vol. III. entitled *Plantæ Eſculentæ*, takes notice, that the author of it ſays, article 90, " That the ſeeds of this graſs are gathered yearly in Poland, and from thence carried into Germany, and ſometimes into Sweden, and ſold under the name of manna-ſeeds. Theſe are much uſed at the tables of the great, on account of their nouriſhing quality and agreeable taſte."

Our ingenious countryman, in his addition to this paſſage, has the following words: " Mr. Dean, a very ſenſible farmer at Ruſcomb, Berkſhire, aſſured me, that a field, always lying under water, of about four acres, that was occupied by his father when he was a boy, was covered by a kind of graſs that maintained five farm-horſes in good heart, from April to the end of harveſt, without giving them any other kind of food, and that it yielded more than they could eat. He, at my deſire, brought me ſome of the graſs, which proved to be the flote-feſcue, with a mixture of the marſh-bent. Whether this laſt contributes much towards furniſhing ſo good a paſture, I cannot ſay. They both throw out roots at the joints of the ſtalks, and therefore likely to grow to a great length. In the index of dubious plants, at the end of Ray's Synopſis, there is mention made of a graſs, under the name of *gramen caninum ſupinum longiſſimum*, growing not far from Saliſbury, twenty-four feet long. This muſt, by its length, be a graſs with a creeping ſtalk; and that there is a graſs in Wiltſhire, growing in watery meadows, ſo valuable, that an acre of it lets from ten to twelve pounds, I have been informed by ſeveral perſons. Theſe circumſtances incline me to think it muſt be the flote-feſcue; but whatever graſs it be, it certainly muſt deſerve to be enquired after.

" There is a clammineſs on the ear of the flote-feſcue when the ſeeds are ripe, that taſtes like honey, as I have often found; and for this reaſon, perhaps, they are called manna-ſeeds.

" Linnæus Flor. Suec. article 95, ſays, that the bran of this graſs will cure horſes troubled with bots, if kept from drinking for ſome hours." So far the very ingenious Mr. Stillingfleet.

From what has been ſaid above, we may conclude, that the flote-feſcue is one of the beſt graſſes that we can cultivate for the uſe of our horſes, and the more eſpecially, as it appears to thrive beſt in wet, low meadows, where many other graſſes would not grow.

There are at Clacton-Lodge, in the county of Eſſex, not far from Thorp, ſome low meadows, which are every year flooded for months together during the winter ſeaſon: theſe meadows are covered with a graſs of a remarkable fattening quality; for when old cows have been turned into them, though they were ever ſo poor and low in fleſh, they have in a very ſhort ſpace of time grown as remarkably fat; and when killed, their meat would appear as fine, and taſte as well, as that of any ſteer or ox; therefore it is reaſonably to be ſuppoſed, that the graſs growing in theſe meadows is no other than that of the flote-feſcue.

FLY, in turnips. *See* TURNIPS.

FLY, in ſheep, a ſpecies of maggot very troubleſome to that animal. The reader will find an infallible method to deſtroy theſe troubleſome inſects under the article SCAB *in Sheep*.

FOAL-TEETH. *See the article* AGE *of a Horſe*.

FODDER, hay, ſtraw, haulm, &c. given to cattle.

In the foddering-yards of backſides, or other outhouſes, to have ſeveral diviſions, over and above what is conſtantly uſed, has great conveniencies in it; one of which is, that in them you may diſpoſe of a two-yearling cow, or another cow, at the time of bulling; not only to keep them from a bull, but from the other beaſts alſo, that would be leaping ſuch a cow, whereby they may hurt each other, &c. eſpecially cows forward with calf will be apt to warp by leaping a bulling-cow.

The open winters make hay the deareſt, if a hard froſt and ſnow come at the fore-hand of them; for if once cattle come to fodder, they muſt be held to it, or they will receive great damage. In waſhy weather all the hay that can be given to cattle will not make them thrive, but in dry froſty weather they will thrive with their meat very well.

Mr. Liſle ſays, that he let his cows go at large from their foddering-yard, during the winter, and ſo continued till April, when they fed on ſome graſs; and thoſe that had calved, he foddered with hay: the conſequence of which was, that by the middle of April his cows would not ſtand to eat any ſtraw at all, but were, during the months of March and April, ſo weaned from ſtraw, by baits of graſs and hay, that they fell off from the ſtraw quite, and grew much leaner, and worſe in fleſh than they had been, and apparently worſe than the farmers cows, which were, after the winter months, wholly pent up to their ſtraw, and to the pond.

All ſorts of cattle that chew the cud, as ſheep, cows, &c. care not to graze after each other, nor to eat one another's leavings in the foddering-yards; but cattle that do not chew the cud will eat after thoſe that do, and *vice verſa*.

Pliny tells us, where hay was ſcarce, it was uſual to feed their cattle with chaff and barley-ſtraw. Of chaff, ſays he, that is the beſt ſort, which is the thinneſt and ſmalleſt, and neareſt to duſt; the beſt therefore is from millet, the next from barley, and the worſt from wheat, except it be for hard-labouring beaſts.

On ſound experience I am convinced, ſays Mr. Liſle, that in our hilly-country we ought not to have any dependence on ſending our cattle out of the foddering-yard to graſs before the middle of May, and therefore we ought to be provided with winter fodder for cows accordingly.

At the beginning of winter, ſuppoſe the latter end of October, and a great part of November, while cattle ſtill continue out in the field at graſs, it is very neceſſary to fodder them early in the morning, while the hoar-froſt hangs on the graſs, which they will not eat kindly off till the ſun has warmed it.

The ſtraddling racks are beſt for foddering, if made ſtrong enough, that is, ſo as not to be over-turned; for theſe racks may be lifted up as the dung mixen riſes, which thoſe fixed in the ground cannot be.

It is a practice in many places, to tie their cows up to a rack to fodder; but if a perſon would rightly conſider the places where it is done, we ſhould find it only uſed where the fodder is good, being either hay, or very good ſtraw; but in the hill-country of Hampſhire, where the cattle have ſtraw fodder only, and that not ſo good as the ſtraw in the valleys, the cuſtom is to fodder their cows in racks, or cribs, in the open yard, which they think better than tying their cattle up to racks in houſes;

houſes; for though in cold and rainy weather the houſes may keep their loins dry, yet in countries where the fodder is coarſe, eſpecially after wet and backward harveſts, when the ſpirit of the ſtraw is waſhed out by the rain, the giving cattle ſtraw from racks, from whence they cannot pick and chooſe, as from cribs they may, is judged to tend to the impoveriſhing the cattle, whereas in cribs they can pick the ſweet from the coarſe.

There is a very remarkable difference in cattle eating their fodder, when freſh threſhed, and when it has been threſhed two or three days, eſpecially if the ſtraw be but indifferent fodder. *Liſle's Huſbandry, vol.* I. *page* 392.

FOGGE, long graſs remaining in paſtures till winter.

FOISSEN, the natural juice or moiſture of the graſs or other herbs.

FOLD, the moveable incloſure wherein ſheep are confined during the night.

It appears that the ſheep-folds of the eaſtern nations were not ſuch as ours, but houſes erected for that purpoſe.

Mr. Garret, who has lived four years in Spain, ſays the ingenious Mr. Liſle, aſſures me, that in thoſe parts where he was, they fold their ſheep as we do ours, only their fold is made netwiſe with ſtrong cords, and about ſix feet high, with the bottom ſtaked down to the ground, and two cur-dogs, of a breed between a maſtiff and a greyhound, lie within the fold to guard the ſheep from the wolf.

" In favour rather of keeping a weather-flock than an ewe-flock on the hill country, beſides other conveniencies, you may have the benefit of the fold for barley at the principal time when it does moſt good, viz. on the fallows between the latter end of February and the middle of April, when the ewes cannot be folded.

" The limitation of an ewe-flock for folding and keeping on throughout the winter, or be it a weather-flock, ought to depend on theſe rules; Firſt, Not to keep more at winter than you can winter either by meads, or ſowed graſſes and hay. Secondly, Not to be ſatisfied that you can provide hay for them by ſowed graſſes, as broad clover, &c. in caſe ſuch lands as are fitteſt to carry ſuch graſſes, lie at a diſtance for mowing, whereby you muſt maintain them with dung, where, by reaſon of carriage, it will be chargeable, unleſs your fold can maintain more ground than your out-lying lands to your farm, which, in the hill country, is not likely: and to carry but ſeven or eight pots of dung in a day, by reaſon of the diſtance, and mowing, is not reaping a profit, but bare exchanging: but if you have much land round about, and near your houſe, whereto you can carry thirty or forty load of dung a day, and which will bear broad clover hay, then you may increaſe your flock proportionably.

" As to fatting your ewes and lambs out of your flock, if you have lands diſpoſed for fatting, you ought to conſider, if you break your flock by drawing out ewes with their lambs for that purpoſe, what flock you will have left to fold on your wheat fallows, and how far your wheat land ſtands in need of a fold; for if you leave yourſelf not ſufficient, it will be indiſcretion to weaken your fold; beſides, it will hurt your breed; for you will draw off many forward lambs, which might, perhaps, have carried on the breed otherwiſe, and when a hill country farmer is ſettled in a flock, it is not good to be buying yearly, to keep up his complement, on account of many dangers which may from thence enſue: it is better, therefore, in ſuch caſe to buy ewes with their forward lambs to put into your fatting grounds; but in caſe you ſow wheat land good enough without the fold, or have another way of manuring it, by liming, &c. then it may be very well to fat off certain numbers of your flock.

" Though, ſays a very good farmer of my acquaintance, I have but a mean opinion of winter-folding, or to fold on barley ſown, and may in time fallow on graſs-ground inſtead of barley-land, yet I would fold on barley-land fallowed or ſtirred, from the time my lambs were ſtiff enough after lambing to go on ſuch fallows; for, ſays he, the benefit of an acre ſo folded, is three times as good as one winter-folded for barley.

" Farmer Glyde, of the Iſle of Wight, with whom I was talking of huſbandry affairs, told me, there was one thing he believed I knew not of, which he would tell me; he would, he ſaid, adviſe me to fold my ewes and lambs on the barley-land in the ſpring, and divide my flocks in folding; for, ſaid he, two hundred ewes and their lambs will do as much, if not more good, by folding on an acre of land, as four hundred weathers: I have, ſaid he, folded a part of the ſame land at the ſame time two hundred ewes and their lambs, and in another fold of equal dimenſion five hundred weathers, and I have always found, that the folding of the ewes did me the beſt ſervice, and brought me the beſt corn.

" My ſhepherd is of opinion, that ewes ought not to be folded on the barley fallows, or any other fallows in lambing-time, but weathers only; for the lambs, being wet when lambed, would be dirted with the fallows, and the ewes would preſently forſake them; therefore the ewes ought in lambing-time to be folded in the meadows, where it is clean, and the folds removed as often as the cold wind ſhould change from corner to corner. And afterwards, he ſaid, they ought to fold weathers on the barley till a fortnight after May, but the ewes never after Candlemaſs.

" It is plain, that the early folding an ewe-flock, and lambs in April, on wheat fallows, pinches the lambs, and ſo does folding them at that time on the barley grounds, both which are too cold for them, eſpecially in our hill country; care ought therefore to be taken, that thoſe lands do not of neceſſity want folding on in thoſe months, but that they may be otherwiſe provided for, and that during that time the ewe-fold may be on graſs-grounds, or lay-grounds deſigned for fallows.

" We muſt be more cautious in April and May of folding an ewe-fold on the barley-land, they being wettiſh, than of folding them on the wheat ſown in Auguſt or September; becauſe the lambs in April and May make the ewes riſe often and move, whereby the ground becomes much more trodden at that time of the year by the ewe-fold, than it would be by a weather-fold, or an hog-fold, as may apparently be ſeen, if the folds be divided.

" Telling Mr. Gerriſh the grazier, and farmer Iſles, how dear Mr. Eyres our miniſter ſold fat lambs to the number of fifteen, May eighteenth, viz. for ten ſhillings and ſixpence each, and that they had been folded all along to the very day he ſold them. They replied, that folding the lambs did very little hurt them with reſpect to their fat, provided they were drove pretty late to fold, and let out early in the morning.

" Walking with Mr. Raymond into his arable common fields, October twenty-fifth (anno 1708) we met his ſhepherd pitching the fold on the new ſowed wheat. I aſked him, whether he did not find that pitching the fold on the wheat at this time of the year, and a fortnight later, turned to a much better account than folding for the barley crop for the year following. Mr. Raymond and his ſhepherd readily replied, undoubtedly it turned to the beſt account to fold after this time on wheat. I ſaid, for my part, I had obſerved the fold carried on the land deſigned for barley ſo early in the winter had little effect, its ſtrength being ſpent and waſhed away by ſpring, ſo that it will make but little ſhew in the crop of barley next ſummer, and that therefore I choſe to preſerve four, five, or ſix acres of wheat-fallow that lies warm, and will bear ſowing late, to carry my fold over to the latter end of October, rather than finiſh my wheat fold by the end of September, and then carry it on my barley; for though the latter part of October might, in our cold country, be too late to ſow wheat, yet it was better than to be ſo ſoon folding barley, which would be no better for it. To which they replied, I was much in the right. And as I have before obſerved how inſignificant the fold is in the winter, eſpecally in hard froſts, I imparted it to Mr. Raymond, who concurred with me, and ſaid, he had folded on arable land in ſnow, and found not the leaſt benefit: whereupon he reſolved in ſuch caſes to fold on meadow and paſture, in mighty expectations of graſs; but it made no return; wherefore in ſnows he now lets his ſheep ramble.

" Whereas I have ſaid, that in cold clay ground, and in a cold hill country, a winter-fold does little good; yet I have by experience found the contrary in ſuch parts of the hill country, where the land is dry and light, and that it does great ſervice to the barley crop. This difference may be reconciled thus, i. e. where the land, though called hill country land, does not lie very high, for the height much tends to the chilling of the ground. Again, the explanatory reason of this difference, though hardly accountable for, yet seems to me chiefly to lie in the chilling quality of the ground which at first receives the dung and piss, and that deadens the ferment; whereas in warmer ground its progression toward that end is supported by a sufficient benign warmth, since in both sorts of earth, the urine does undeniably sink into the earth, and mix with it.

" My ground being cold and feeding, I should in the spring of the year, when I come either to pitch my fold on the barley fallows, or on the sown barley, set it very wide, in order to avoid the usual inconveniencies of penning at that time, viz. the rankness and lodging of the barley, and the consequences, thinness and coarseness.

" It was the tenth of October (anno 1720) when my fold was going to be set on the wheat-fallows of a field, which was heavy land, and the fallows, where the fold was to go, were to be ploughed up the next day; I was afraid the land would be too wet to fold on after the wheat was sown, and spoke to the shepherd about it. He said, he believed I might be in the right, especially since the rams had been some days put to ramming the ewes, because the rams would keep moving and stirring the ewes all night in the fold, whereby the ground would be battered and trod, and so squatted, that the wheat might not get through.

" That the Greeks did pen up their sheep, that they might piss through hurdles, as in Herefordshire, you may see in Palladius's calendar, November, to avoid dirtying and damaging their fleeces.

" Farmer Miles, whom I have often mentioned with approbation, advised me, if I would turn arable into meadow, and lay it up to grass, to fling straw upon it that is less than half rotten, and then fold upon it the same night, and it will bring the ground on very fast.

" Pursuant to what has been before said, that folding in winter for barley is not profitable, because, by waiting for the fold's running over the land, we lose the principal season of fallowing; yet however it may be proper to fold till Christmas, and then go on the wheat-lay; because we can lose no fallowing season by that; we cannot well have finished our fallowing any year before Christmas.

" I find by Mr. Antill and Mr. Clerk, and others, that in Leicestershire they have no winter-folding for barley; they leave off by Michaelmas at farthest, and sometimes cannot fold again till May; the reason is, their lands are so wet they would be always in a poach, and the coldness of the lands would kill the sheep: to help which defect, they muck their barley-lands, and from thence begin their husbandry, and sow wheat the year after, often under furrow, on their barley-stubble, for they say, if they should dung their wheat-ground it would rot their wheat, and they sow pease or beans after the wheat, and then lay the ground to summer-fallow again, to be mucked in May for barley, or to fold for wheat; so that they carry out their dung before it is half rotten, or the seeds of the weeds killed: but in their inclosures they sow four crops of corn all on one earth, without dung, for the most part beginning with oats, and laying down to grass with wheat.

" I am told, that in Dorsetshire the aim of the farmers is, to fold on their sheep-leases in the middle of July, and so till Michaelmas, that in the winter there may be a good head of grass for the milch-ewes.

" It seems to be inconvenient to grasp at so large a wheat or barley-crop, as hardly to be able to compass it without folding late on the wheat after it is sowed, or on the barley-land after it is sowed; for by being under the above necessity, in order to compass what one has engrossed, one may often be obliged to fold unseasonably on each sort of corn, nor will the fold in that case make good the damage done to the flock by the lateness of the season: and an ewe-fold is often damaged by folding on the cold land at the latter end of October; whereas it is better to come early with your fold off of the wheat-lands on to the barley lay-grounds, and from the sowed barley on to the wheat-fallows; for thereby you will fold the same quantity of ground of the respective grains without the respective inconveniencies.

" Between washing and shearing-time sheep ought not to be folded, because of dirtying their wool, nor from the cutting of the lambs till a fortnight after, nor in sheap-leases or arable in wet weather, for it will tread the grass into dung.

" A servant of mine, a man of very good understanding, tells me, he has been many years a shepherd, but could never observe that the fold ever did any good in frosty weather: particularly he remembers a very sharp frosty winter, in which a whole flock used daily to gather to a hay-reek, in a ground where they were foddered, yet he could not observe there was any better corn there than elsewhere. I asked him the reason of it; he said, the frost wasted and preyed on the dung; and I the rather approve this observation of his, because of the great prejudice strong beer and spirits receive by being frozen, even so as to become mere *caput mortuum*.

" If frost has the same effect on dung, by impoverishing it, that it is said to have on the sheep-fold, and on strong beer: quere, whether it be proper or not, to leave horse or cow-dung spread on land without ploughing it in?

" Mr. Raymond is also of opinion, that the winter-frosts do very much deaden the folding of the sheep, and rob it of its virtue.

" Farmer Elton said, the method he best approved of in folding, was always to fold that land first that was first designed to be ploughed, such as white or whitish land, they not being apt to bear weeds, nor will the fold be apt to cause weeds to come, and such land he would sow first, viz. at St. James's-tide. I said, I should think, though such land should be sowed ever so wet, yet, if the month of August should prove dry and scorching, it would burn, and suffer by such early sowing. He replied, if sowed wet, yet so as it came up, he never knew the drought to hurt it.

" It was a very dry season from the first of March to the sixth of May (anno 1701) during which time I set my fold on my barley. Several of the farmers in my neighbourhood said, it would be apt to do the barley more harm than good, for the sheep would scratch up the seed; whereas, if rain had come, so that the ground had not been in a dust, their scratching would have done no harm. But I rolled before I set my fold, and so I presume the ground was so fast as to receive the less damage, it being also stony, and therefore the sheep could not search it so much as otherwise perhaps they might have done: the event was, the fold did no harm, but good.

" Mr. Gilbert of Madington was telling me, the way of husbandry about him, near Salisbury, was, to fold on their wheat after it was sowed till St. Luke's-tide, which is in the middle of October; then to draw off their flock for a month to fold their sheep-leases, and then on the barley-fallows. I asked some North-Wiltshire farmers, if about them they ever folded on the wheat-land after it was sowed; they said no, they never knew it to be done in any parts thereabouts, yet folding after the corn was sown did it more good than before; but the reason why they did not do it about Holt, &c. they believed was, because they were forced to lay up the wheat-lands in high ridges by reason of the deepness of the earth, and its wetness, and the sheep if folded on such land, would do nothing but lie between the furrows, which would do the land but little service: besides, they said, in the hill-country the land was rather of the lightest, and the treading of the sheep, after it was sowed, pressed it closer than it was before, and so did it service.

" Mr. Raymond assured me, that sheep folded on sandy lands would thereby be sensibly more impoverished than those folded on clay lands, and this, said he, the shepherds agree to, who live where there are such different sorts of land. The reason seems to be, because the sandy lands draw forth and drink up the moisture of the sheep, to fill up which emptiness of the outward vessels, a fresh juice must succeed, and so on; or else that the sandy lands being hot, make the sheep perspire more than clay lands do, whereas the cold clay rather repels perspiration.

" If sandy or light ground, as has been before hinted, draws the fat and moisture of the sheep-fold off, so as to impoverish a flock more than if they had been folded on

cold

cold clay lands, it muſt be allowed, on the other hand, that light ground may be better enriched by a fold than heavy land, becauſe the light ground imbibes more of the moiſture and fat of the flock; and this gives ſome account why it is ſaid, poor lands often pay better for their folding than ſtrong lands: for the ſame reaſon winter folding, when the ground is wet and cold, holds no proportion to ſummer folding.

" Diſcourſing with farmer Biggs on huſbandry, he ſaid, he folded on the fallows all winter long, though never ſo wet; yet, ſaid he again, ſometimes the fold does harm: let it be never ſo wet, ſaid he, early in the year, folding on the fallows does no harm; for, in the firſt, there is heat enough in the ground at the firſt hand of the year to keep off the chill, and then the ground is not ſo ſettled, but that the rain ſoon runs through it, but at the latter end of the year the ground is ſettled; then treading it with the fold in wet weather makes it hold water, by which it may be chilled, and kneads the very wet into it, whereby there will be the leſs corn.

" Before I came from Crux-Eaſton in February (anno 1698) in order to go into the Iſle of Wight, I had a diſcourſe with an old experienced ſhepherd about folding the flock on fallows: he ſaid, as to wheat, it was excellently good, but they rarely folded on barley-land after it was ſowed, for if it was a whitiſh land, and a hot ſummer came, it would be burnt up: beſides, the ſheep would be ſcraping at that time of the year on barley-land, and would take the corn out of the ground; but the wheat, ſaid he, lay too deep for them to do ſo. But when I came into the Iſle of Wight, farmer Collins was of a different opinion, and ſaid, he had always folded with good ſucceſs on hot, dry, ſandy ground after it was ſown with barley, and was earneſt with me to try it; for, ſaid he, you will quickly ſee the benefit, and though the ſheep ſhould ſcrape, you will find the barley come thickeſt there. There is land, however, about Huſborne and Stoke in Hants, that will burn by folding on in the ſpring, and get more harm than good, if hot weather come, it being a hungry ſharp gravel.

" As it ſeems to me, the double folding on the early wheat-fallows, to be ſown on one earth, cannot occaſion the roots of the graſs ploughed-in to ſhoot up afreſh, but rather prevents it, by treading the earth down into a hard plaiſter, ſo that they cannot riſe; it is true, it may bring up a freſh new graſs, which, having weak roots, will eaſily be torn up by the draggs.

" Columella, ſpeaking of feeding ſheep, ſays, there is no ſort of land, or food, but what (by the continual uſe of that only) ſheep will be tired of, unleſs you give them ſome ſalt now and then to lick, from whence they may procure a new appetite to their meat and water. All the ſummer time during the hot ſeaſon they muſt be let out to feed as early as may be, while the dew is on the graſs; and when the ſun is about four hours high, they muſt be led to water and under ſhade, and again to feed towards ſun-ſet. In the dog-days the flock ſhould be ſo led as to feed with their heads towards the weſt in the forenoon, and towards the eaſt in the afternoon; for it is of great conſequence, ſays he, that the ſheep's heads ſhould be turned from the ſun, which would be hurtful to them. And Varro gives the ſame directions, becauſe, ſays he, the ſheeps heads are extremely ſoft. Perhaps this may be the chief reaſon of the rams and ewes in companies turning face to face, in hot ſun-ſhiny days. During the winter, and early in the ſpring, they ſhould be kept in their fold, till the ſun has melted the hoar-froſt from the graſs, which would occaſion rheums in their heads, and would alſo ſcour them: for this reaſon in the cold wet ſeaſons of the year they ſhould be watered but once a day. They let their ewes, as Varro aſſures us, go out to feed with the reſt of the flock, but kept back the lambs, which were ſuckled by the ewes at their return, and then again ſeparated from them. They alſo tethered their lambs at ten days old, leſt they ſhould diſlocate or hurt their tender limbs by playing together." *Liſle's Huſbandry*, *vol.* II. *page* 178.

FOLE-FOOT, the ſame with colt's-foot. *See* Colt's-Foot.

FOOD, a general name for whatever aliments are taken into the body to nouriſh it.

Food *of plants*, the particles they extract from the ſoil, air, &c. in order to their nouriſhment.

Philoſophical inquiries into the principles of vegetation, and the manner in which it is performed, are an object well worthy the attention of gentlemen whoſe ſituation allows them to purſue that truly uſeful and entertaining ſtudy. But as the induſtrious huſbandman, for whoſe benefit this work is chiefly intended, as a compendium of the beſt practice in agriculture, founded on the reſult of experience, cannot afford time for matters of ſpeculation; nor would they, in point of prudence, conſiſt with his neceſſary occupations, even if his education fitted him for ſuch reſearches; it may be ſufficient for him to form a general, but juſt, idea of the means by which plants are moſt ſucceſsfully raiſed. A proper notion of this will help to guide him in the management of his lands, and ſhew him in what ſtate the earth ſhould be, to enable the plants which he cultivates moſt eaſily and readily to find their neceſſary food. This general knowledge of the baſis of agriculture is even requiſite in every one who would be ſatisfied of the reaſonableneſs of his methods of proceeding.

Whether any one active principle does univerſally nouriſh all plants, or whether ſome particular ſalts or juices feed one plant, and others another, is a queſtion that has been warmly debated by philoſophers.

The ancients generally entitled the earth to the production of the animals, vegetables, and other bodies, upon and about it; but ſeveral of the moderns, and among them ſome of very great name, both here and abroad, have declared in favour of water, as the efficient cauſe of vegetation. Lord Bacon was of opinion, that, " for the nouriſhment of vegetables, water is almoſt all in all; and that the earth doth but keep the plant upright, and ſave it from over-heat and over-cold." Others carry this hypotheſis ſtill farther, aſſerting water to be the only principle or ingredient of all natural things. They ſuppoſe that, by I know not what proceſs of nature, water is tranſmuted into ſtones, into plants, and, in ſhort, all other ſubſtances whatever. Van Helmont, and his followers, to whoſe opinion even the illuſtrious Mr. Boyle has ſhewn a ſtrong propenſity, are very poſitive in this, and alledge, as proofs, the conſiderable growth of mint, and ſeveral other plants, in water, and his well-known experiment on a willow-tree. Van Helmont planted this tree, which weighed five pounds, in two hundred pounds of earth dried in an oven, and watered it with rain, or diſtilled water, after carefully covering the caſe in which it ſtood with a perforated tin cover, to prevent the admittance of any other earth. Five years after, weighing the tree, with all the leaves it had produced in that time, he found its weight amount to one hundred and ſixty-nine pounds three ounces; while the weight of the earth was only diminiſhed about two ounces.

Mr. Evelyn thought, with the learned Dr. Sharrock, whom he quotes, that water is, of its own conſtitution alone, a ſoil to vegetables, not only as the moſt genuine vehicle of the riches which it imparts to plants, through the ſeveral ſtrainers, and by means of which all change and melioration is effected; but becauſe it is, of all other ſubſtances, beſt diſpoſed for ingreſſion, to inſinuate into, and fertilize the earth; which is the reaſon why floated grounds are ſo remarkably fertile after the flood has ſubſided. " It is, ſays he, the neareſt of kin to the whole vegetable race; for to aſſert, with any confidence, what part of the mere earth paſſes into their compoſition; or whether the earth ſerves only for ſtability, or as a womb and receptacle to their ſeeds, I ſhall not undertake to diſcuſs; though I do not yet conceive the earth to be altogether ſo dull and inactive, as to afford no other aid to the generation of what ſhe bears; the diverſity of ſoils being infinitely various, and the difference of inviſible infuſions far beyond our arithmetic. But neither do I here by any means exclude the air, nor deny its perpetual commerce and benign influencies, charged as it comes with thoſe pregnant and ſubtile particles, which pervading and inſinuating into the earth's more ſteady and leſs volatile ſalts, that inteſtine fermentation is begun and promoted, which gives life, growth, and motion, to all that ſhe produces. Dr. Mayow has proved, that the moſt exhauſted and worn-out mould, if repaired by a bare expoſure to the air alone, without which it produces nothing. Nor can plants, totally excluded from the air, live, or so much as erect themselves to any thriving purpose, as being deprived of that breath and vital balm, which no less contributes to their growth and nourishment than does the earth itself, with all our assistance. Besides, we find that the air is near of kin and affinity to water, and indeed seems as if it were but a thinner water; for how else are vines, and other trees of prodigious growth, maintained among barren rocks, and thirsty pumices, where rains but seldom fall, if not from the benign influencies of the air?"

To this aerial food and moisture it is that most of the sedum kind owe their growth. Succulent groundsel, and the fragrant wall-flower, draw their nourishment from the same source. An ash now growing out of a wall of the abbey-church at St. Alban's, affords a remarkable instance how much even trees are nourished by the air.

As all kinds of water, as well as air, contain many other substances besides the pure elements of water and air, it is difficult to ascertain whether these extraneous substances, or some of them, are not the food of plants. Dr. Woodward's experiments, as related in the Philosophical Transactions, seem to confirm the opinion that they are: for he observes, that a great part of what he calls terrestrial matter, mixed with the water in his experiments, ascended up into the plant, as well as the water; and that the plants were more or less nourished in proportion as the water in which they stood contained a greater or smaller quantity of that matter. With regard to Van Helmont's tree, and the growth of plants in water, he very justly observes, that nothing like what the advocates for water would infer from thence, can possibly be concluded from any such experiments, unless the water used in them be absolutely pure, homogeneous, and not charged with any sort of terrestrial mixture, to which the plant may owe its growth and increase: for that all water, even the clearest and most transparent, does abound with such matter, will appear to any one who shall put some of the very purest into a clean glass phial, and stop it with the greatest care. Though perfectly transparent at first, it will grow cloudy, if suffered to stand some time without being stirred, and at length deposite an opaque sediment. Filtring and distilling will indeed intercept some of the earthy particles with which it is naturally charged; but neither of these operations, nor any other that we know of, though ever so often repeated, will free it entirely from all extraneous matter, some of which will always remain in it, very fine and light, fit to attend every motion of the water, whose extreme tenuity, and exactly spherical globules, enable it to pervade smaller ducts than even imagination can conceive. We hardly know any fluid in all nature, except fire, whose constituent parts are so extremely subtile as those of water. They will pass through pores and interstices, impervious to air, or any other fluid. This enables them to enter the finest tubes and vessels of plants, and to introduce the nutritive matter lodged in the earth, conveying it to all parts of them; whilst each, by means of organs it is endowed with for the purpose, intercepts and assumes into itself such particles as are suitable to its own nature; letting the rest pass on through the common ducts.

The judicious Mr. Worlidge, uninfluenced by the new and prevailing mode of thinking in his time, according to which all vegetables were supposed to be fed by water only, declares positively, that he cannot but explode this opinion as destitute of foundation; for that, although several plants set in water only, do emit fibrous roots, and flourish therein for a time; yet, at best, this nourishment is but weak, because water does not contain a sufficient quantity of the true nutritive particles, as the willow, poplar, and other aquatic plants raised therein, demonstrate, and as is still farther evident from their better thriving if the water be often changed. "Experiments, says he, have been made of gourds and cucumbers, planted in baked earth, and watered with water only; and after they have grown to such a bulk as the experimenter thinks proper, they are weighed, and also the earth, which last is probably but little diminished, or perhaps not at all; from whence they conclude, that the substance of those vegetables proceeded from the water. Thus have men made experiments speak as they would have them, to favour the new opinions they would impose on the credulous."

Spring and rain-water contain pretty near an equal charge of vegetable matter; river-water more than either of them. Nor can any doubt be made, but that the water which falls in rain at some times, is more charged with particles fit for the vegetation of plants, than that which falls at others. A more powerful degree of heat must draw up a larger quantity of that matter, with the humid vapours which form rain, than a more feeble warmth possibly can. The water of one spring may also flow with a higher charge of this matter than that of another: this depending partly upon the quickness of the ebullition of the water, and partly upon the quantity of that matter latent in the earth, through which the fluid passes, and the greater or less laxity of that earth. For the same reason, the water of one river may abound with it more than that of another; and the same river, when much agitated, may bear up more of it than when it moves with less rapidity.

Though water be not itself the food of plants, it is an absolutely necessary agent, by which the matter proper for their nourishment, which remains inactive till it be diluted by, and incorporated with this fluid, is conveyed to them, and introduced and distributed into their several parts, both from the earth and the air. But still it is not capable of performing even this office, without the concurrent assistance of heat, which gives it the necessary action, exalts and digests the nutritive juices, dilates the pores of the plant, and raises the sap into the stem, branches, and fruit, where the sun perfects the work, by ripening it.

The necessity of heat in vegetation is apparent from our fields and forests, our gardens and our orchards. We see, that in autumn, as the power of the sun decreases, so its effects on plants diminish, and their vegetation slackens by degrees. Its failure is first discernible in trees, which, being raised high above the earth, require the most heat to elevate the water, charged with their nourishment, to their tops and extremities; so that for want of fresh support and nutriment, they shed their leaves, unless secured by a very firm and hardy constitution, like that of our ever-greens. Next, the shrubs part with theirs; and then the herbs and lower tribes; the heat being, at length, not sufficient to supply even these, though so near the earth, the fund of their nourishment. As the heat returns with the ensuing spring, they all recruit again, and are furnished with fresh supplies of verdure: First, Those which are lowest and nearest the earth, because they require the least degree of heat to raise into them the water with its nutritive charge; next, the shrubs and higher vegetables, in their turns; and, lastly, the trees. As the heat increases, it grows too powerful, and hurries the sap with too great rapidity through the finer and more tender plants. These, therefore, go off and decay; and others, which are more hardy and vigorous, and require a greater degree of warmth, succeed in their order.

Mr. Tull is the only person who makes earth the food of plants. The experience of all ages contradicts this opinion; for the necessity of inducing something into poor soils, to enable them to produce crops, is universally acknowledged; whereas, if earth alone was the food of plants, it would in all cases produce the same effect.

As to the grand question, whether plants of different kinds are nourished by one universal food, or whether each particular species imbibes only its peculiar aliment; the supporters of this last opinion, among whom are the great lord Verulam and Dr. Woodward, say, it is not possible to conceive that one uniform homogeneous matter should constitute bodies so unlike in all respects as the various tribes of vegetables; nay, even as the different parts of the same plant. But a moment's reflection will shew, that the latter part of this objection confutes the former; for if the plant has the power of altering the original juices taken in by the roots into so many various forms as experience proves it has, each plant may be indued with the faculty of assimilating to itself the juices it meets with in the earth; as we find the same food not only nourish different animals, but produce in each its peculiar character.

We have ocular demonstration, that the willow and alder thrive best on a moist soil, and that the elm, pine, fir, and cypress, prefer a drier earth. Yet these, and many

many more of the wideſt difference, are ſometimes ſeen to draw their whole ſuſtenance, bulk, and ornaments, whether annual or perennial, from the juices they find in the ſame piece of ground, and from the ambient air and dews; though our ſtricteſt diligence cannot diſtinguiſh the particular aliments which approach their ſeveral roots. Changing the earth about the roots of theſe, or any other trees, whoſe bark, ſap, fruit, and ſeed, are of very different kinds and qualities, will only make each tree proſper the better. "Hence, ſays Dr. Beal, we may juſtly ſuſpect, that the very contextures of their bodies, from the firſt ſpirting of their ſeed, and as they are formed gradually from the inviſible principles or ſpirit and vigour of their ſeeds, however ſmall and imperceptible, are the natural alembics, where the common rain-water and air are digeſted into very much differing leaves, fruit, ſeed, reſins, gums, &c. perhaps as the cow's belly converts the common juices of all ſorts of graſs into milk, or as the bee collects honey and wax from all ſorts of flowers."

The ſame ſoil that has once been proper for the production of ſome ſorts of vegetables (continue thoſe who think that each particular ſpecies of plants has its particular food) does not always continue to be ſo; but in time loſes its property. If wheat, for example, be ſown upon land proper for that grain, the firſt crop will ſucceed very well, and perhaps the ſecond, or as long as the ground is in heart; but in a few years it will produce no more, if ſown with that corn. Some other it may, as barley, rye, or buck-wheat.

That this is owing to an improper culture of the land, more than to any defect in the ſoil itſelf, will evidently appear to thoſe who ſhall candidly weigh the principles of the New Huſbandry, when that ſubject comes to be treated of.

Mr. Du Hamel makes no doubt, but that the particles which plants appropriate to themſelves, take different forms in each plant, and even in the ſeveral parts of the ſame plant; but, as he juſtly obſerves, it does not at all follow from thence, that they were not originally the ſame. What would induce one to think them the ſame, is, that plants of different kinds rob one another of the nouriſhment which is in the earth: for, if a lettice, for example, drew from the earth a food different from that of endive, a lettice planted among endive would not only thrive better than if planted among other lettice, but as well as if no other plant was near it. But we know, by experience, that this lettice would grow very poorly, and conſequently that plants, though of different ſpecies, do hurt and rob one another. If each plant drew from the earth only the particular juices proper for itſelf, poppies, thiſtles, &c. which kill wheat, would not in that caſe do it any hurt, farther than by ſhading it with their ſtalks. But that the injury they do the corn is chiefly occaſioned by their roots, which conſume the neceſſary nutritive juices, is evident from this, that if dry branches were ſet in ſuch numbers as to make even a greater ſhade than thoſe weeds, they would not equally prejudice the growth of the wheat.

After ſome other arguments of equal force, Mr. Du Hamel concludes, that plants of different ſpecies feed on the ſame, or nearly the ſame ſubſtance; that there is no plant which does not rob thoſe that are within its reach of ſome part of their food; and that the ſoil which once is good for any one kind of plant, will always be able to ſupply it with food, provided it be properly cultivated.

To prove that the ſame juice takes different qualities in the veſſels of the ſame plant, he inſtances an experiment which he made, by grafting a young lemon, of the ſize of a pea, by the ſtalk, upon a branch of an orange tree. It grew there, ripened, and retained its quality of lemon, without partaking in any ſhape of that of the orange. The juices of the orange tree muſt therefore have changed their nature at once, on their paſſing into the lemon.

It is an old opinion, generally received by the ancients under the name of occult qualities, or ſympathy and antipathy, that ſome plants delight in being near each other, while others will not live together. Several of the moderns have likewiſe embraced this ſentiment, and urged in ſupport of it, the fig-tree and rhue, garlick and the roſe, which, ſay they, agree remarkably well together, becauſe the juices ſuited to the one are avoided by the other. Lavender, laurel, thyme, marjoram, and other aromatic plants, cannot, on the contrary, according to them, flouriſh together, becauſe they feed on ſimilar juices, of which they rob one another. Mr. Evelyn ſeems to be nearer the truth, when, ſpeaking of this ſubject, he aſſigns as a reaſon why ſome plants will not thrive near others, certain effluvia or ſteams emitted by the one, which may be noxious to the other. Plants will not thrive under the walnut-tree, the oak, and others of the ſame kind, becauſe their numerous and wide-extended roots exhauſt the earth around them, and the drippings from their leaves are impregnated with an acrid matter, which is an enemy to vegetation.

Though there are evident inſtances of an election of food in ſome plants of very different kinds, ſuch as the aquatic race, and thoſe which delight in a dry ſituation; yet, ſo far as relates to the farmer, they may be ſaid to be nouriſhed with one and the ſame ſubſtance; but at the ſame time it is neceſſary, that both the earth and that ſubſtance be fitted for receiving and nouriſhing them: for be the earth ever ſo good, rich, and proper for the production of vegetables, little will come of it, unleſs its parts have that juſt degree of ſtrength, or coheſion, which ſhall give ſtability to the plant, and at the ſame time afford an eaſy admittance to the fibres of its roots, to ſpread and extend themſelves in ſearch of that food.

FOOT, the part that ſupports an animal.

A horſe may have a very well made foot, and well proportioned, and yet if it chance to be thin and weak, the buyer will be diſappointed of his expectation; for ſuch a foot is liable to be ſpoiled in ſhoeing, by travelling on hard ſtony grounds, by too much drought in hot ſeaſons, or by too much moiſture in winter. A thin foot is that where the cruſt or horn is thin. This may be eaſily ſeen when the ſhoe is taken off, becauſe the verge all round the ſole will appear thin; and where it is ſo, a horſe will winch with the leaſt touch of the pincers; but as this trial will ſeldom be allowed in buying of a horſe, the beſt way to thoſe who would be acquainted with ſuch things, is to obſerve the bottom of the cruſt, which is generally ragged, and where the ſhoe-nails are clenched and rivetted: if theſe be high, it is a token the foot is thin, and that there has not been ſufficient hold for the nails, without driving them a good way upwards in the cruſt. In a thin foot, the heel and frog are alſo apt to be ſoft and tender to the touch, and by reaſon of the weakneſs natural to ſuch kind of foot, it ſometimes turns away, and one point of the heel will ſtand higher than the other, though this may be alſo owing to the crookedneſs of the paſtern joints, and will ſometimes happen where the foot is tolerably ſtrong; but is moſt common to ſuch as have weak feet; and where it is ſo, the horſe wears his ſhoes more on one ſide than the other, and often cauſes him to cut, and go lame in a journey.

As a thin weak foot is juſtly reckoned a very great defect in a horſe, ſo a very ſtrong foot is not always the moſt eligible, but is liable to ſeveral accidents. A ſtrong foot has the fibres of the hoof very diſtinct, and for the moſt part run in a ſtraight line from the coronet to the toe, like the grain of oak, lignum vitæ, or any other hard wood that eaſily ſplits; and though ſome ſuch feet will laſt very well, and keep free from accidents, where ſufficient care is taken to keep them moiſt and pliable; yet when they happen to be neglected upon a long journey, or much hard riding, eſpecially on dry ſtony grounds, or when they ſtand long in a hot dry ſtable, they will go lame and tender, at the ſame time that no defect is to be ſeen on the foot; for when the ſoft parts within are bruiſed by the hardneſs of the hoof, or by the thickneſs and hardneſs of the ſole, which in all ſuch feet is like a plate of iron; and when this happens, a horſe will be in pain, and the true cauſe ſometimes not found out for a long time, which I have known in ſeveral inſtances; nor is it eaſy to reſtore ſuch feet to a due temperament, as will be ſhown hereafter.

When a horſe that has a very ſtrong foot takes up a channel nail, or happens to be cut into the quick with a ſharp bone, a ſharp flint, or piece of glaſs, and a flow of humours follows upon ſuch a wound or puncture, the confinement theſe meet with from the ſtrength of the foot create much anguiſh, and, for want of vent below, frequently cauſes an eruption round the coronet, which proves

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for the moſt part troubleſome, and makes the cure tedious and uncertain, eſpecially when ſuch caſes happen to fall into bad hands.

I have known ſome inſtances where the hoof and the ſole have been quite looſened from all their attachments to the foot, the filaments and fibres that unite the horny part to the fleſh being all torn and pulled aſunder by the thickneſs and ſtrength of the horn; and where this happens in any degree, it is apt to leave a tenderneſs behind it, unleſs an uncommon care be taken to prevent it.

But the greateſt inconveniency in a very hard ſtrong foot, is its being ſubject to reſts and fiſſures, which cleave the hoof quite through, ſometimes from the coronet down to the bottom; and this kind of foot is the more eaſily expoſed to ſuch accidents, that the horny fibres have a more viſible ſtraight direction than where the feet is more ſoft and pliable; theſe clefts, being for the moſt part in the quarter, ſeldom admit of any other remedy than extirpating the whole piece that lies next the heel, which defect is from thence called a falſe quarter, wherein the cure is ſeldom ſo perfect, eſpecially in the fore feet, as to leave no infirmity or blemiſh behind it. When the fiſſure or cleft does not penetrate through the horn, but makes a line on the ſurface, it is called a ſand crack, being very common in ſome ſandy countries, where the horſe's hoofs turns dry and crack with the heat of the ſand. Theſe are but little regarded where the lines are ſuperficial, and not deep in the horn, and are often cured by raſping the foot, and keeping it cool and moiſt. However, it is a defect that muſt leſſen the value of a horſe, in proportion to the degree of goodneſs or badneſs of his foot; for when the foot happens to be otherwiſe bad, theſe blemiſhes often degenerate, and are of ill conſequence.

The next defect I ſhall take notice of in the feet, is of thoſe horſes that have narrow heels. Some horſes feet are tolerably good, even where the heels are narrow; but when the foot is hot and inclined to rottenneſs, and the quarters loſe the round turn that they ought to have as they approach the heel, and look as if they were bent and pinched together, inſomuch that the heels of ſome ſuch horſes are not above two fingers in breadth, then the foot is bad; and the way that many take to mend theſe kind of feet, by hollowing on each ſide the frog, and thinning the quarters to cauſe them to ſtretch to a wider ſhoe makes them worſe; for the ſtretching out the quarters contracts the hoof on the inſtep, and almoſt always turns ſuch horſes hoof-bound, and wire-heeled.

But horſes often grow hoof-bound from other cauſes, and in ſome it proceeds from the ſhape of the coffin-bone, when it happens to be flat or hollow, where it ought to be riſing and round, when the coffin drops by thinning the ſole too much, and not taking care to ſtay it up with ſtuffing and ſplinters, and from diſeaſes in the feet that leave a weakneſs and deformity in them. But when a horſe that has a very ſtrong flinty foot happens to be hoof-bound, the caſe generally turns out bad. For the harder the hoof, the more it preſſes round the inſtep and heel. This preſſure makes the parts all round the coronet to grow fleſhy and project over the inſtep, ſo as to be conſtantly bruiſed by the upper part of the hoof, eſpecially when a horſe carries any great weight upon him, and by this means in the end ingenders a quitter, which creeps ſo under the hoof that it can ſeldom be removed without the loſs of a quarter, the ſame as when there is a fiſſure and cleft, or rather worſe, becauſe of the depreſſion and binding all round the upper part of the foot with the diſtemperature of the coronet, which often renders ſuch cures both very tedious and imperfect. Therefore this ought to be well looked into, eſpecially in chooſing a ſaddle horſe, that his feet be tolerably ſhaped, ſmooth, and cool, not narrow heeled, nor hoof-bound, neither weak-footed, nor too remarkably ſtrong; for moſt horſes of this latter kind are alſo coarſe, and chiefly fit for labour.

Another thing that ought carefully to be looked into, is that both his fore-feet be of equal ſize; for wherever this defect is the leaſt apparent, though it may proceed from a horſe's uſing one leg more than the other, as it happens to working men who uſe the right-hand and arm more than the left; yet when one foot is ſmaller than the other, it is a blemiſh, and carries ſome doubt that ſuch a foot may in time fail and periſh, even as theſe do that have been hurt by accidents, or after old lameneſſes in the ſhoulders, legs, and muſcular parts, where the foot at laſt periſhes in proportion as the muſcular and nervous parts ſhrink and diminiſh.

Another defect in horſes feet, is when they are flat and without depth. If ſuch a foot happens to be ſtrong, and the hoof ſmooth; if the ſole be alſo firm, and the frog no ways rotten or fleſhy, ſuch a horſe will endure the roads tolerably well. But when a flat foot is ſhaped like an oyſter, has many rings or wrinkles, if the ſole be ſoft, and the frog fleſhy and ſpongy, it is a very great defect. Some horſes are ſo remarkably faulty in this reſpect, that the frog bunches out beyond the bottom cruſt of the hoof, that their ſhoes muſt be made hollow, and the plates ſo broad as almoſt to cover the whole bottoms of their feet, to keep them from the ground. But indeed ſuch horſes are only fit for a draught, and not for the ſaddle.

Some horſes have tolerably good feet, only that their heels are low. Horſes that have long yielding paſterns are the moſt ſubject to this defect, and alſo thoſe that have their paſterns very ſmall, ſhort, and ſtanding almoſt quite upright; theſe have generally long heels and flat feet, and their fore-legs coming ſtraight down from the ſhoulder to the foot, without any bending of the paſterns, and for this reaſon are frequently called goat-legged. Many of the horſes bred in the fens are of this kind, have but an awkward uſe of their limbs, and make very bad travellers, and thoſe low heeled horſes which have very long yielding paſterns, are apt to have their heels wear quite to nothing upon a journey, and all the care imaginable in ſhoeing cannot prevent it.

A very high heel is another extreme, which greatly leſſens the value of a horſe; for even where ſuch a foot happens to be ſtrong and ſmooth, it is nevertheleſs the cauſe of unſteadineſs in a horſe's going, expoſes him often to trip and ſtumble, to ſprains in the coffin and paſtern-joints, &c.

There is one kind of horſe, eſpecially among the coach and cart breed, very remarkable for a large deep foot; the horn extremely thick and ſcaly, the heels broad and mouldering, and are apt to grow ſo very faſt, that the farriers when they go about to ſhoe ſuch horſes, thinking to eaſe them of their great load, and to bring their feet into a better ſize, pare and raſp them to ſuch a degree, that they leave their feet much larger about the coronet and inſtep than at the bottom; ſo that they always look as if they went upon pattens, which is not only very ugly, but ſuch horſes are ſeldom good for much.

A very large foot of any kind is to be avoided in a horſe, even ſuppoſing it to be in itſelf firm and good. But when I ſpeak of a large foot, I mean only when it is diſproportioned to his other parts, for a large horſe muſt of courſe have a larger foot than a ſmall one. But when we ſee the foot large, and the limb ſmall, in all ſuch it muſt be obſerved by thoſe who have experience, that the bones and ſinews are alſo ſlender, which not only denotes weakneſs, but heavineſs and inaptitude to any briſk and vigorous action; and therefore unfit for the coach or ſaddle, but to draw in a cart or waggon, or to carry a burden.

Some object greatly againſt white feet, as being generally worſe than thoſe of any other colour. Indeed when a horſe has too many of his feet white, they do not always prove the beſt, yet I have ſeen white-footed horſes have their feet ſuch as the ableſt judges could not find fault with. When a foot is ſmooth and tough, of a middle ſize, without wrinkles, neither too hard and brittle, nor too ſoft, and when the heel is firm, open, and no ways ſpongy or rotten, and the frog horny and dry, and the ſole ſomewhat hollow, like the inſide of a diſh or bowl, whatever be the colour, ſuch a foot will for the moſt part turn out good, though the dark or black hoof, where it reſembles that of deer, is generally the beſt; and for this reaſon thoſe who are the moſt curious about a horſe's feet, do not chooſe ſuch as have much white upon their legs and paſterns, to avoid their having too many white feet. *Gibſon's Farriery, vol.* I. *page* 19.

FORK, an inſtrument divided at the end into two or more points, or prongs.

FORKEN ROBIN, an earwig; ſo called from its forked tail.

FOSSE, a ditch or moat.

FOSTAL,

FOSTAL, a way leading from the main road to a large houſe.

FOUL FEEDING, a voracious appetite to which ſome horſes are ſubject, and, though not properly a diſeaſe, is often the cauſe of various maladies. It is generally the effect of ſome latent diſtemper, as vermin, which have a quite different effect on ſome horſes to what they have on others; for as horſes of a lax habit of body often loſe their appetites by worms, and are frequently griped and ſickly in their bowels; ſo horſes of ſtrong rigid conſtitutions, that can bear the irritation thoſe animals make in their inteſtines, are often voracious in their appetites, and continually craving after food.

Foul-feeders, however, differ in ſome things from thoſe that have voracious appetites: for as the latter crave only after their common food, and can hardly ever be ſatisfied; ſo the latter will leave their hay to eat their litter, and ſeem to like it the better when it is well ſauced with their own dung and urine; and, therefore, they may be properly ſaid to have a vitiated or depraved appetite. Though this does not always proceed from a voracious appetite, yet the firſt is often productive of the latter, and may probably be occaſioned by enlarging the capacity of the ſtomach and inteſtines to ſuch a degree, that nothing will ſatisfy their cravings, but what has weight and ſolidity; for the ſame kind of horſes will eat mould and wet clay, or any kind of foul naſty weeds out of the ditches, and in the ſtable will eat ſtinking muſty hay, which the generality of horſes will refuſe.

There are others of depraved appetites, that are neither foul nor voracious feeders, ſuch as we often obſerve eat dry loam or mud out of the walls, which perhaps denotes ſome vitiated juices in their ſtomach; and this alſo is frequently owing to vermin, or at leaſt to a bad digeſtion, though perhaps not to any imbecility in their conſtitutions; for though thoſe horſes have a longing after thoſe extraneous things, yet their appetites at the ſame time ſeldom fail: but as this is often owing to full feeding, with the want of ſufficient exerciſe, ſo we often ſee them recover and quite loſe that vitiated taſte, when they come to ride a journey, or go upon any other conſtant exerciſe.

The beſt method in all theſe caſes of a vitiated or depraved appetite, is to begin with purging, and to diſſolve chalk in their water, and afterwards to give them good exerciſe. The ſame method may be complied with to thoſe that feed voraciouſly. To theſe the following draught may alſo be given, to blunt their appetites:

> Take a large handful of the roots of marſhmallows, cummin-ſeeds, and fenugreek-ſeeds, of each an ounce: liquorice roots ſliced, half an ounce; boil in three pints of water till the roots are ſoft and ſlimy, then pour off the decoction, and diſſolve in it an ounce of gum-arabic, and add four ounces of linſeed-oil.

Let the horſe have four handfuls of this every morning faſting, till his appetite abates. If the horſe be lean, which many voracious feeders are, he will gather more fleſh under this management, and as his fleſh increaſes his appetite will abate.

As to foul feeders, many of theſe begin with voraciouſneſs, and when they come to be ſtinted, take to eating of their litter to fill their ſtomachs, and in time take a great liking to it; and it is obſervable, that many of the horſes that go broken winded, have this evil faculty; and therefore I ſhould adviſe any one who has a foul-feeding horſe, to keep his ſtall as clean as poſſible, to let no wet, dirty litter, lie under him, nor to put his litter under the manger, but to beſtow it on ſome other horſe, otherwiſe they will paw it out, and feed upon it greedily; but clean ſtraw that has not been ſoaked with horſe-piſs and filth, will never hurt any horſe; for though there is no harm in the urine, yet when the ſtraw has been ſoaked in it with the dung, it often turns into a wad, or like a ſponge in their bowels, and cauſes great diſorders. But when their wet litter is taken away every morning, it may be the means to make them leave off that ill habit. *Gibſon's Farriery, vol.* II. *page* 96.

FOWL, a general name for all ſorts of birds; but uſed in a particular ſenſe to ſignify ſuch as are bred in the farmer's yard for profit.

The countryman's farm or habitation cannot be ſaid to be completely ſtored or ſtocked without fowl as well as beaſt, which yield a conſiderable advantage by their eggs, brood, bodies, and feathers. Any poor cottager that lives by the highway-ſide may keep them, they being able to ſhift for themſelves the greateſt part of the year, by their feeding on inſects, corn, or any thing almoſt that is eatable by any other ſort of animal: and therefore they are kept to great advantage at barn-doors, and other places, where corn or ſtraw is ſcattered.

As for cocks and hens, we ſhall not enter into a deſcription of the ſeveral ſorts of them, only obſerve that thoſe that are the beſt breeders, and the beſt layers, are to be choſen, the oldeſt being always the beſt ſitters, and the youngeſt the beſt layers; but no ſort will be good for either, if they are kept too fat. The beſt age to ſet a hen for chickens, is from two years old to five; and the beſt month to ſet them in, is February, though any month between that and Michaelmas is good. A hen ſits twenty days; wheras geeſe, ducks, and turkeys, ſit thirty. Obſerve to let them have conſtantly meat and drink near them while they ſit, that they may not ſtraggle from their eggs, and chill them. One cock will ſerve ten hens.

If fowls are fed with buck or French wheat, or with hemp, canary, or millet-ſeed, which is commonly ſown in March, it is ſaid they will lay more eggs than ordinary; and buck-wheat, either whole or ground, and made into paſte, which is the beſt way, is a grain that will fat fowls or hogs very ſpeedily; but the common food to fat them with is barley-meal wet with milk or water; but wheat-flour is better: but if you deſign to bring up chickens, give a barley-corn or two to each of them, as you take them out of the neſt, and ſo continue to feed them till they are fit for fatting.

For the beſt methods of breeding ducks, geeſe, turkeys, pigeons, ſwans, peacocks, &c. *ſee each under its proper article* DUCKS, GEESE, TURKEYS, &c.

FOWL'*s Dung*. *See the article* DUNG.

FOX, a well known animal of the canine kind, with ſharp ears, and a buſhy tail.

The fox is very prejudicial to the huſbandman, by taking away, and deſtroying of his lambs, poultry, geeſe, &c. eſpecially in places that are near foreſt-woods, and covert places. The beſt way of deſtroying them is with guns or traps, after this manner: if you deſign to ſhoot them, procure a ſheep's paunch, and tying of it to a long ſtick, rub your ſhoes well upon it, that the fox may have no ſcent of your feet, and draw the paunch after you, with which make a trail a mile or two in length; and order it ſo as to bring it near ſome thick-headed tree. At which place, when you have made your trail, leave your paunch, and with your gun get up into the tree; and as ſoon as it begins to be dark, you will ſee him come by you upon the ſcent of the trail, where you may ſhoot him. Obſerve that you draw the trail to windward of the tree, if you can.

But if you have a mind to catch them with a ſteel-trap, which is the ſureſt way, chooſe a place to ſet it in a plain part of a large field; let it be out of the way of all paths, but not near either a hedge or any ſhelter. Open your trap, and lay it upon the ground, and cut out in the turf juſt the form thereof, and take out ſo much earth as may make room to lay it, covering of it again very neatly with the turf you cut out; and becauſe the joints of the turf will not cloſe exactly, get ſome of the fine mould that is to be found in a new caſt up mole-hill, and fill the joints with it, taking ſome graſs, and ſticking of it in the mould, as if it grew there. Make all ſo fine and plain, as that it may deceive your own eye to look upon it. About eight or ten yards from the trap, three ſeveral ways, ſcatter ſome of the fine mould that you had out of the mole-hill, very thin, upon a place about fourteen or fifteen inches ſquare; and upon theſe places, and where the trap is, lay two or three ſmall bits of cheeſe, and with a ſheep's paunch, as is before directed, draw a trail of about a mile long to each of the three places, that are at a diſtance from the trap, and from thence to the trap, that ſo the fox may come upon one of thoſe places firſt, which will make him

him approach the trap with more boldneſs, where you will ſeldom fail of him; only you muſt obſerve not to faſten your trap, but to leave it looſe, that he may draw it to the hedge-ſide, or to ſome cover, or elſe he will bite off his leg, and be gone.

Some bend down a ſtick in the wood, and ſet a trap for them in their paths, like that which is ſet for woodcocks, which hangs them up, or any other ſort of vermin. *Mortimer's Huſbandry, vol.* I. *page* 312.

FOX-TAIL GRASS, the ſame with cow-wheat. *See the article* COW-WHEAT.

FRAGRANT, odorous, ſweet of ſmell.

FREE-MARTIN, a barren heifer.

FRENCH BARLEY, a ſpecies of barley called by botaniſts *tritico ſpeltum*. Some call it wheat-barley. It is naked, and the grain like wheat, but the ear ſhaped like that of the common barley. This ſpecies is often ſown about Rowley, Hamſtal, and Redmore, in Staffordſhire. It yields a large increaſe, and makes good bread and good malt. *See the article* BARLEY.

FRENCH-BEANS. *See the article* BEANS.

FRITH, an arm of the ſea running into the land.

FROST, the laſt effect of cold; the power or act of congelation.

Froſt is a great fertilizer of land, and therefore when the ſoil be a harſh, churliſh, or obſtinate clay, it ſhould be turned up in ridges at the beginnning of winter, which will greatly tend to remove its bad qualities, and ſeparate its particles.

Hard winters are generally of ſervice to corn in many reſpects; eſpecially if the land has been thoroughly drained, and is well covered with ſnow. This laſt mellows the ground, and keeps it warm; while froſt, neither the rigour nor duration of which need be feared if it comes on gradually, and the land is dry, not only kills great numbers of vermin and inſects, but, by leaving the earth in a looſe ſtate, fits it for roots to extend themſelves therein as the warmth of the ſpring approaches, and thereby enables them to produce ſtrong plants; whereas frequent rains in winter, without froſt, ſodden the earth, which afterwards produces nothing but blades, ſoon to be deſtroyed by the hoar froſts of the ſpring, by inſects, and by weeds; or which would yield at moſt only ſtraw without grain. The winter's froſts may indeed nip off the blades; but then the roots being unhurt, new ones will ſhoot up in the ſpring. This was the caſe in the remarkably ſevere winter of 1608, of which Mezeray ſpeaks, and which, notwithſtanding its extreme ſeverity, was followed by a plentiful harveſt; and ſuch alſo, or nearly ſuch, was the long winter of 1729.

The great danger from froſts is, when the earth is wet, and not covered with ſnow. For example, if a ſtrong froſt returns after a ſudden thaw, the fibres of the roots are broken by the expanſion of the ſurrounding water when frozen, and the too great abundance of moiſture in the plants themſelves, when frozen, tears their fibres to pieces by the ſame expanſion. This was what happened in 1684.

Early in the ſpring of 1710, the parliament of Paris, hoping that the corn cut off by the preceding winter would ſhoot out again, as it did after the winter of 1608, mentioned by Mezeray, forbid ſowing anew the lands which had been ſown the autumn before: but the expectation now proved groundleſs, the plants having been totally deſtroyed by repeated froſts, intermixed with frequent thaws; ſo that had it not been for the barley that was ſowed afterwards, which yielded ſuch prodigious crops, that the French ſtill call that year the year of barley, the dearth muſt have been much more dreadful than it was. In that very ſpring, after the hard winter, ſeveral people in the dutchy of Berry, and elſewhere, ſowed wheat, which ſpouted well, and grew, but did not ſpindle; whereupon ſome mowed their crops, and others turned in cattle to feed as in a meadow; but after another winter had paſſed over them, theſe very fields yielded the next year as plentifully, as if they had been ſown anew. In incloſed grounds, the corn near hedges, which ſecured it from the north wind, reſiſted all the rigour of that exceſſive cold; and in other places, where the poor peaſants raked up all the ſnow they could collect, and ſpread it with their hands upon the uncovered ſpots of their ſmall fields, their corn was preſerved, and yielded a good crop.

A gentleman, now living in England, had a field of wheat ſo greatly damaged by alternate froſt and thaw, that the neighbouring farmers thought he could not do better than plough it up for ſpring corn; but obſerving that many of the plants were yet alive, and in a condition to be recovered, though thinly ſcattered, he hand-hoed the whole, and reaped three quarters of corn from each acre of this land.

FROWAR, the name of an edge tool, uſed in cleaving laths.

FRUIT, the produce of a tree or plant, in which the ſeeds are contained.

Thouſands of objects teach us, that moiſture and warmth are the great cauſes of putrefaction. From the decay of many otherwiſe laſting bodies, we learn, that the alternate changes of heat and cold, of dryneſs and moiſture, moulder to pieces even the ſolid oak. Theſe general cauſes of putrefaction and decay ſhould therefore be avoided, or prevented, as much as poſſible; and to this end an equal ſtate of the air, with regard to heat and dryneſs, becomes neceſſary in a repoſitory for the preſervation of fruit. The want of dryneſs renders cellars in general unfit for this purpoſe; though ſome of them may, perhaps, be dry enough; and if they are, the other requiſite, of an equal ſtate of heat, is uſually found in them: but as this is not often the caſe, it is ſurely worth the gentleman's while to provide a receptacle on purpoſe for his fruit. A cloſet, ſurrounded every way with good walls, and furniſhed with double doors, promiſes the beſt ſucceſs. In this cloſet, different compartments, or bins, may be made of brick, which continues much drier than ſtone or wood. Large jars, or caſks, will alſo anſwer the ſame end, when they are cloſely ſtopped; and ſo do boxes, as it is well known to the London fruiterers. Either of theſe may be proportioned to the quantity which it is adviſable to keep in each, that is, to the quantity that is to be conſumed within a few days; for even in ſuch a place the fruit ſhould be expoſed to the air as little as can be, before it is eaten. Experience will ſoon ſhew to the good manager the importance of this caution.

When the fruit, we mean chiefly apples and pears, for they are fitteſt for keeping, has been carefully gathered by hand, in perfectly dry weather, and ſweated for ſome days, in heaps on a clean floor, till it has diſcharged its watery and crude juices, each apple or pear muſt be rubbed ſingly with a coarſe cloath, to clean and dry them, and if the leaſt hurt or ſpeck tending to putrefaction appears at this wiping, all the fruit ſo marked muſt be laid aſide, as unfit for keeping. A layer of very dry ſtraw ſhould be laid at the bottom of the veſſel, whatever it be, in which they are to be preſerved, and upon this a layer of perfectly ſound apples or pears; then another layer of ſtraw over them, a layer of fruit upon this, and ſo alternately till the whole intended quantity is put in. We have named ſtraw, becauſe it is eaſieſt to come at; but any other ſubſtance, which is perfectly dry, and leaſt liable to corruption, will do. If, therefore, each layer of fruit is ſheltered above and below with a covering of paper, to preſerve it from the taſte which ſaw duſt might give it, this bids fair to anſwer the deſired purpoſe. On this principle it is that roots are preſerved in ſand: the only objection to which, for the uſe here intended is, that its weight may hurt the fruit, otherwiſe it promiſes well, when perfectly dry.

FRUIT-TREES, a general name for trees that produce eatable fruit, as apples, pears, plums, peaches, apricots, figs, &c. See each under its proper article.

FRUNDELE, two pecks, or half a buſhel.

FRUSHES. *See* RUNNING-THRUSH.

FUDDER, a load. It properly relates to lead, and ſignifies a certain weight, viz. eight pigs, or ſixteen hundred weight.

FULLERS EARTH, a native earth found in many parts of England, and much uſed by fullers in cleaning and ſcouring their cloth. It is of a very fat nature, and very full of that vegetative ſalt that helps the growth of plants; and therefore may be uſed with advantage, where it is found in plenty, on ſome ſorts of land.

FURLONG, the eighth part of a mile.

FURROW, a trench made by the plough.

FURZE, *whins* or *gorſe*, to which C. Baukin and Mr. Ray, give the name of *geniſta ſpinoſa*, and which Linnæus

næus and Miller call *ulex*, propagate themſelves ſo rapidly, by ſowing their ſeeds, that, where they are once eſtabliſhed in a ſpot of ground, they ſoon over-ſpread the whole place; for, as the ſeeds ripen, their pods are opened by the warmth of the ſun, and they are thrown out with an elaſtic jirk to a conſiderable diſtance all around. There they vegetate, and the ground is ſoon filled with young plants, which are not eaſily deſtroyed after they have taken good root. The only way of extirpating them, is by paring off and burning the ſurface of the ground. *See the article* BURN-BAKING.

This is by ſo much the more adviſable, as theſe ſeeds will otherwiſe remain a long while ſound in the earth, and grow whenever they are brought up by ploughing; and alſo becauſe the ſmalleſt fragments of this plant will ſtrike out freſh roots, and ſhoot up anew: but when a good thickneſs of the ſurface is pared off, and burnt, the ſeeds are ſo effectually deſtroyed, and the roots are killed to ſo conſiderable a depth, that neither can again give riſe to new plants; and if a few of theſe do appear, a ſummer fallow will put an entire end to their growth. Their increaſe may likewiſe be prevented by good manuring with marl, chalk, or lime, eſpecially in ſandy ſoils, which are the moſt apt to produce this plant, and which are at the ſame time the moſt benefited by thoſe helps.

However, this very plant, formerly deemed a great nuiſance, is now cultivated to advantage on light, ſandy, dry ſoils, which would otherwiſe turn to little account. The tops of the common Engliſh furze, bruiſed a little, to take off, or to blunt their prickly tips, have been found to be excellent fodder, even for lean ſickly beaſts, and particularly horſes, which they have frequently recovered, and plumped up in a ſhort time. This cuſtom is much practiſed in ſeveral foreign countries, where furze are cultivated purpoſely for fodder; and the peaſant thinks it a happineſs, that his breaking their ſpikes with a mallet enables him to give this wholeſome green food to his cattle in the winter, when often no other ſucculent plant can be had fit for that uſe. The mills which Sir Capel Hanbury has lately erected for this end in Wales, with a patriotic ſpirit, well ſuited to his diſtinguiſhed zeal for the public welfare, will ſave the countryman that laborious taſk, and prove highly beneficial to thoſe who follow his judicious example.

When furze are raiſed on purpoſe for the food of cattle, and eſpecially on ſoils like the above mentioned, their ſeeds ſhould be ſown in February, March, or April, and the ground ſhould be prepared as for barley. Six pounds of them will be ſufficient for an acre of land; and they ſhould be but barely covered over. The young plants muſt be preſerved from cattle during the firſt year, and they will be fit to mow or cut in the next. October is the proper time to begin cutting them. They will continue to ſhoot till Chriſtmas, and be fit for uſe till March. Horſes eat them as readily as they do hay, after they have been bruiſed, or pounded, ſo as to take off their ſharp points; and it is ſaid, that an acre of ground will produce fifteen tons of this fodder, and that it will go as far as an equal quantity of hay. Some mix the bruiſed furze with chopped ſtraw; an hundred of ſtraw to a ton of furze; but only the growth of the year ſhould be cut for cattle.

Poor hungry gravelly ſoils, which would not have let for five ſhillings an acre, have been rendered worth twenty ſhillings an acre, by ſowing them with furze ſeed, in places where fuel has been ſcarce; this being frequently uſed for heating ovens, burning lime and bricks, and alſo for drying malt; but it is not worth cultivating in countries where fuel of any kind is cheap, or upon ſuch lands as will produce good graſs or corn.

Some years ago, the common furze uſed to be much ſown for hedges about fields; and where the ſoil was light, the plants ſoon became ſtrong enough for a fence againſt cattle: but as theſe hedges grow naked at the bottom in a ſhort time, and the plants frequently failed, ſo as to leave conſiderable gaps, this practice has of late been greatly diſuſed. The ſpecies commonly called French furze is the beſt for this purpoſe, becauſe it thickens more near the ground, and grows to a greater height: but its ſhoots are not tender enough for cattle to eat them. This is alſo conſidered as the moſt difficult to extirpate: though Mr. Bradley, who tells us he had ſeen fields of one hundred and fifty acres planted with it in Devonſhire, ſays, that it may be killed by cutting the woody ſtalks within a foot of the root in ſummer time; for that it will not then ſpring up again like the ſmall wild furze or whins, by which name Mr. Markham diſtinguiſhes the ſmaller from the larger ſort. This begins to blow in the middle of January, and continues in bloſſom all the ſummer; while the Engliſh furze does not bloom till towards the end of the ſpring, and finiſhes its bloſſoming at the ſame time as the other.

The marquis of Tourbilly obſerves, that cows, oxen, and moſt other cattle, as well as horſes, feed heartily upon, and are well fed by, the bruiſed tops of furze; and that we may be ſure corn will do well where-ever this plant is met with: for be the ſurface of ground what it will, the ſpontaneous growth of the furze always indicates a depth of good mould underneath; and the continual dropping and rotting of the leaves, will infallibly improve and enrich the ſurface. The flowers of the furze are excellent for bees.

FUZZEN, *or* FUZEN, the natural juice or nouriſhment of any thing; the ſtrength of it.

G.

GALLERY, a kind of covered walk in a garden, formed into porticoes or arches, with horn-beams, lime-trees, or the like.

GALLING *of a horſe's back*, a diſorder occaſioned by heat, and the chafing or pinching of the ſaddle.

In order to prevent it, ſome take a hind's ſkin well garniſhed with hair, and fit it neatly under the pannel of the ſaddle, ſo that the hairy ſide be next the horſe.

When a horſe's back is galled upon a journey, take out a little of the ſtuffing of the pannel over the ſwelling, and ſew a piece of ſoft white leather on the inſide of the pannel; anoint the part with ſalt butter, and every evening wipe it clean, rubbing it till it grow ſoft, anointing it again with butter, or, for want of that, with greaſe: waſh the ſwelling, or hurt, every evening with cold water and ſope, and ſtrew it with ſalt, which ſhould be left on till the horſe be ſaddled in the morning.

GALLON, a meaſure of capacity both for dry and liquid things, containing four quarts; but theſe quarts, and conſequently the gallon itſelf, are different, according to the quality of the thing meaſured: for inſtance, the wine gallon contains 231 cubic inches, and holds eight pounds avoirdupoiſe of pure water: the beer and ale gallon contains 282 ſolid inches, and holds ten pounds three ounces and a quarter avoirdupoiſe, of water; and the gallon for corn, meal, &c. 272$\frac{1}{4}$ cubic inches, and holds nine pounds thirteen ounce of pure water.

GALLOWS *of a plough*, a part of the plough-head, ſo called by farmers, from its reſemblance to the common gallows, as conſiſting of three pieces of timber, of which one is placed tranſverſely over the heads of the other two. *See* PLOUGH.

GAP, a breach, or opening made in a hedge.

GARDEN, a plot of ground cultivated and properly ornamented with a variety of plants, flowers, fruits, &c.

The generality of writers upon this ſubject, and indeed moſt gardeners, in their practice, have, at leaſt till of late years, treated the pleaſure garden, the fruit garden, and the kitchen garden, as three quite diſtinct and ſeparate objects, not only in point of culture, but even of ſituation, ſoil, and incloſure. They are undoubtedly right as to the firſt: but we ſee no reaſon for disjoining the two laſt, unleſs it be in written accounts, where, for the ſake of greater order and perſpicuity, and for the conveniency of the reader, their ſeveral products, and the different ways of managing them, may with propriety be given ſingly, as will be the method here.

The pleaſure or flower garden, being intended ſolely for ornament and recreation, does not belong to this work, the main deſign of which is utility. We ſhall therefore only obſerve, in relation thereto, that the gentleman who can afford to be at the expence of ſuch a garden, for the laying out, planting, and managing of which he will find ample and excellent directions in Mr. Miller's Dictionary, will, of courſe, place it in a properly conſpicuous part, where it may afford the greateſt entertainment to the eye. Conſequently he will order it to be made next to, or juſt againſt, the back front of his houſe, from whence a deſcent of at leaſt three, but rather of ſix or ſeven, ſteps will ſingularly embelliſh the whole. He will allow room for a ſufficiently extenſive lawn, which, if it be the firſt thing that ſtrikes the ſight, will have an elegant effect; for ſpacious walks, one of which, ſo contrived as to be perfectly dry, and every now and then to lead to a ſhady place, or into plantations of ſhrubs, where a perſon may walk in private, ſhould ſurround the whole garden, were it only for the benefit of exerciſe. He will have wilderneſſes, groves, green-houſes, &c. and he will be particularly careful to provide plenty of water, for caſcades, fountains, and winding ſtreams, which laſt, if ſo conducted as to imitate nature, will give life and beauty to the whole, beſides being of neceſſary uſe for watering the ground. Statues and vaſes, judiciouſly diſpoſed, are alſo, here, pleaſing and proper objects: but neither theſe, nor any of the buildings in the garden, whether temples, grottos, alcoves, or other, ſhould by any means be too much multiplied, or crowded.

Mr. Miller obſerves very rightly, ſpeaking of pleaſure gardens in particular, that the great art of laying them out, is to adapt their ſeveral parts to the natural poſition of the ground, ſo as to have as little earth to remove as poſſible; for this is often one of the greateſt expences in making of gardens: though it may with truth be affirmed, that, wherever it has been practiſed, nine times in ten it has proved the worſe: ſo that if, inſtead of levelling hills to form large terraces, ſtiff ſlopes, and even parterres, or ſinking of hollows and raiſing of hills, the ſurface of the ground had been only ſmoothed and well turfed, this would have produced a much better effect; and have been more generally approved, than the greateſt number of thoſe gardens which have been made with an infinite expence both of time and of money.

The boundaries of theſe gardens, whatever they are fenced with, ſhould be carefully hid by plantations of flowering ſhrubs, intermixed with laurels and other evergreens, to conceal the fences, which have a diſagreeable look when they are left naked and expoſed. All the boundaries ſhould not be ſeen from any one point of view: and if the country around affords a variety of pleaſant proſpects, it will be right to bound the pleaſure garden by an ha-ha ditch and wall, to lay open thoſe views.

Neither

Neither the husbandman, nor the country gentleman of moderate fortune, who prefers utility to ostentatious show, can set about an easier or more profitable branch of culture, than that of the kitchen and fruit garden, which may very properly be intermixed, and occupy one and the same spot of ground, since they both require a good, deep soil, and nearly the same exposure. The walls which inclose the kitchen garden, in order to secure its product, will be extremely serviceable for fruit: and, if elegance should be studied, this united garden may still be placed out of view from the dwelling-house.

The chief things to be considered in the choice of a spot of ground for a kitchen and fruit garden are, the situation, the soil, the conveniency of water, the extent most proper to be inclosed, and the manner of inclosing it, and laying it out.

If the husbandman can choose his soil and situation for a garden, the former should be rich, rather stiff than light, and considerably deep. Nor is a moderate degree of moisture here by any means an objection. The situation should be nearly level: because heavy rains would wash away the richest part of the mould, if the declivity were considerable. If he has not a level spot near his house, the ground intended for the garden may be made into flats with terraces supported by strong walls, which will become useful for fruit-trees. A gentle inclination may be preserved, to answer Mr. Miller's idea of having one part of dry ground for early crops, and the low part for late crops, in order that the kitchen may be the better supplied throughout the season with the various sorts of herbs, roots, &c.

He should not be discouraged at some seeming disadvantages to which his soil and situation may expose him; for no difficulty is so great, but that it may be overcome by care, industry, and perseverance. Of this we have a striking instance in the following part of a paper which D. J. Beale read to the Royal Society, some years ago, with a view to the improvement of gardening in Scotland.

"I had, says he, several conferences with Sir Robert Murray (who was an honour to his country, and a blessing to the place where he abode) concerning esculent and olitory gardens, and (under one) nurseries of fruit-trees, and other useful vegetables in Scotland. I represented, that, almost within my memory, they are become the chief relief of England; that austere fruit has been found to yield the strong and sprightly liquor which resembles the wine of the grape; that the return of gain from gardens is great and speedy; and that nurseries are neither a chargeable nor a burthensome addition, but a motive of encouragement to persevere in the noblest kind of agriculture. Sir Robert granted all I said: and I am sure he executed all that he could for the benefit of his own country, and of this. But, said he, there are so many rocks, and such bleak winds, in Scotland, that it can hardly draw in the same yoke with England, for gardens and orchards. I replied, that, in Devonshire and Cornwall they fence their gardens and orchards with Flanders furze and tall holly, from the sea winds; that they have lofty firs and goodly pines in Scotland; and that New England, where the winds are as keen, and the snow and frosts as deep, and as long lasting as in many parts of Scotland, is nevertheless full of fruitful orchards. And if Scotland be farther in the north, yet Norway is rich in boscage; and the seeds of the hemlock, fir, spruce, and cedar, from New England, Newfoundland, and Virginia, may perhaps rejoice in the exchange of Northern America, for the north of this island.

"This, I told Sir Robert, I durst undertake; that when Edinburgh and their chief towns and universities shall plant kitchen gardens, as we do now in England, they shall receive their grateful reward the first year, and bear the charges of their nurseries abundantly, and so hold on, and within seven years secure their posterity of the benefit, and delight themselves with the fruit of their pleasing labour.

"Now for fertilizing rocks, I made bold to repeat it often, that, within a day's journey of the heart of England, I could shew three gardens, the best that I have seen for flowery beauties, English ever-greens, and sallads all the winter long; all these on a hard rock, in most places but one foot deep under earth, in some two, and in very few three, with very lofty hills close to the south side, the declivity of the gardens due north, and the rock perfectly bare next to the walls on the north side. I likewise saw rich hop yards in the same case, but in deeper ground, next to the garden on the south side: and these northern hop yards escaped many blasts, which seized on the hop yards on the south side of the hill. On the steep ascent on the north side of one of these rocky hills, where no plough could come, I saw a gentleman ploughing up the shallow tuf with a hand-plough, for flax; and I saw good flax grow there, to the largeness of a village-field. His hand-plough had a stem of ash, or sally, about seven feet long, and a plate at one side near the end, to turn the turf; a coulter to be let out shorter or longer, to cut the turf four, five, or more inches deep, as the land permitted, and a small iron wheel. This hand-plough the master and the man, by turns, drove before them with a walking speed; having leathern aprons before them, to save their cloaths. For the causes of this hardy fertility, let philosophers account. I am sure of the truth of what I write.

"It is no hard task to shovel down the shallow and mossy turf, from the deepest declivities of rocks, into places where it may have a receptable or stay, and there, with the spade to mix and impregnate it with compost for gardens or vineyards. There too the tenth part of an acre in gardening may yield more profit, than ten acres of ordinary tillage in a corn field." *Philosophical Transactions, number* 116.

On the other hand, we have many proofs that wet, and even very marshy, grounds have been converted into excellent kitchen gardens, after they have been drained. Such was, formerly, all that large part of Paris which still retains the name of *le marais* (the marsh;) and such were, evidently, several of our most profitable gardens around London. The marquis of Turbilly has given us farther instances of this truth in several of his noble improvements; and the Memoirs of the truly patriotic Society of Berne remark very justly, that all legumes and pot-herbs thrive perfectly well in the black, rich, moist, and somewhat rising, grounds, which most commonly skirt the borders of marshes.

As warmth is essentially necessary to a garden, it is advisable that the exposure of the ground intended for this purpose be to the south-east, or south; and that it be protected from the north and north-east, either by high grounds, or plantations of lofty trees at a small distance. Fruit-trees require to be likewise protected from the south-west and west, which are apt, in the autumn, to shake the fruit.

The husbandman should here spare no trouble or expence to render his soil of a proper quality and depth: and if it be not naturally so, he must have recourse to one or other of the methods practised for the improvement of soils, according to the nature of his ground.

Whatever the soil be, the mould in which the plants are to live and thrive should be deep enough to afford their roots full room to extend themselves. It appears by several experiments, that the roots of many plants, not excepting even annuals, pierce to the depth of eighteen inches, and more. To allow therefore a sufficiency of room, though perhaps more than may be really wanted, a depth of three feet of good mould should be allotted them here: and if the soil underneath is clay, or retentive of water, which would be apt to chill the roots of plants, it will be right to exceed even this depth.

Trenching is the most effectual way to obtain a considerable depth of well loosened mould. The common method of doing this, when the soil underneath is clay, is to begin with digging a trench four or five feet wide, either along or across the whole ground; then to lay in the bottom of it, about half a foot thick, long dung, fern, leaves of trees, rotten sticks, weeds, or any other such like trash, to rot and keep the soil from binding; then to fill this up with the earth dug out of the next adjoining trench, laying uppermost the spits that were lowest, and so to continue till the work is finished, without ever going deeper than just to the clay, though the surface be never so shallow. But if the clay be dug into, and part of it be turned up and mixed with the other earth, its bad qualities will soon be corrected by the influencies of the air, rain, tain, and one winter's frofts; it will become good and fertile mould, and the depth of the ftaple will be increafed thereby, efpecially with the addition of a little drift fand, coal, or other afhes. The beft time for trenching of land, that it may receive the benefit of being well mellowed, is the beginning of winter; when alfo, being moift, it is eafy to dig.

When the mould on the furface is but fhallow, and lies on a bed of fand, gravel, or loofe earth, it will be advifable to lay a layer of ftiff earth, inclining to clay, at the bottom of the trench. This will be more efpecially neceffary for the growth of trees, or plants whofe roots naturally pierce deep: for by means of this earth, thofe roots will fpread horizontally in the mould, inftead of ftriking down, as they would otherwife do, into barren earth, which would immediately make the trees decay and become ftinted. And another advantage attending this method will be, that as water cannot fo eafily defcend through this ftiffer foil, the earth will be thereby preferved in a fo much moifter ftate; yet even here the clay fhould not be fuch as is impervious to water; for this, unlefs it lie very deep, would be attended with as bad confequences as the other extreme.

The general practice of gardeners is regularly to trench their ground, and lay it rough in the winter, without fufficiently confidering the quality of the foil, or the nature of the earth which lies underneath. But a little reflection would convince them of their error. Let us, in this light, fee what is the effect of trench in various foils. If the ground is naturally light, and lies on a bed of fand or gravel, it is to be feared that every fubftance brought to improve the foil, together with its fineft and richeft particles, will be carried down into that fand or gravel. Does not too frequent trenching contribute to this lofs? as does likewife laying the furface rough in the winter: for the rains wafh the finer mould into the hollow places, from whence, the depth of the foil being leaft there, it is moft readily carried down into the loofe earth underneath. If the foil underneath is ftiff, frequent trenching is proper in order to bring back to the furface the rich mould that has been wafhed down: and if it be naturally ftrong, the laying of it rough in the winter is an advantage, becaufe the winter's frofts will moulder its tough ftrong particles.

This method of preparing the ground is, undoubtedly, expenfive: but its fertility afterwards will yield an ample reward.

Plenty of water is abfolutely neceffary in this garden, and therefore great care fhould be taken to provide it, in fuch manner that it may become at as eafily as poffible. If a fufficient fupply of it can be obtained from the neighbouring grounds, two or three bafons fhould be made in different parts of the garden, if it be a large one; for when the water is to be carried to a confiderable diftance, the expence attending this neceffary bufinefs will be great, and there will be danger of the plants fuffering for want of it; labourers being very fparing of their work, efpecially when it is toilfome, unlefs they are well looked after. The fize of thefe bafons fhould be proportioned to the quantity of water that will be wanted, or with which they can be fupplied: but their depth fhould not exceed four feet, for fear of accidents, if people fhould chance to fall into them: befides which, deep water is not fo well warmed and tempered by the fun and air, as when it is fhallow.

The methods ufed for collecting and preferving of water in ponds or refervoirs in the field, are equally applicable to the making and replenifhing of thefe bafons in the garden. But it will be proper here to add the following more particular cautions and inftructions of Mr. Miller, who, after obferving, that the beft time of the year for lining thefe bafons with clay, particularly in loofe or fandy land, and for afterwards covering that clay with a thick layer of coarfe gravel, is in autumn, when the fun is declining, and the weather temperate, advifes, "as a farther means of fecuring this clay from being cracked by the heat of the fun, or by froft, to lay upon the rim or top of it, around the fides of the bafon, a ftratum of fand, then a ftratum of good earth, and upon this a layer of thick turf. The grafs thus laid will root in the mould underneath, and bind the whole firmly together: and it fhould be laid as far down the infide of the bafon, as the water is apt to fhrink to, that no part of the clay may be wholly expofed to the weather.

"No trees or fhrubs fhould be fuffered to grow near thefe bafons, left their roots fhould penetrate into them, and thereby occafion holes through which the water would find an eafy paffage. Neither fhould thefe refervoirs be made near to tall trees, becaufe the fhaking of them, by violent winds, would be apt to loofen and crack the clay.

"In countries where clay proper for this purpofe cannot be eafily had, thefe bafons are frequently lined with chalk beaten into fine powder, and made into a fort of mortar, which is rammed down and worked very hard and firm all over their infide. This cement holds water very well, if the pond be not fuffered to remain too long dry: for when this happens, the fun and wind are apt to crack the chalk, and thefe cracks generally extend through its whole thicknefs, fo as to let out the water.

"Some line thefe ponds with bricks laid in terras, which is a good method where the ground is very loofe and fandy; becaufe when thefe walls are well built, the furrounding earth may be rammed down clofe to them, fo as to prevent its falling away, or fettling from them. But, as heat is apt to crack the terras, no part of this lining fhould be left long dry and expofed.

"Others again ufe for this purpofe a cement of powdered tile and lime, two thirds of the former to one third of the latter, beaten well together, and worked up with but little water: for the ftiffer it is, and the more it has been beaten, the better it will be. With this cement they cover the furface of the walls of bafons about two inches thick, laying it very fmooth, and taking great care that no fticks, ftraws, or ftones be mixed with it. This is generally done in dry weather; and as foon as the whole infide of the bafon has been plaiftered in this manner, it is rubbed over with oil or bullock's blood, and the water is let in immediately after. This cement has the property of hardening under water, fo as to be equal to ftone; and it will continue as long found."

Where a fupply of water for bafons and ponds cannot be obtained, wells muft be dug, and it is generally advifed, that the water taken out of them be expofed to the fun and air for fome time, before it is ufed, becaufe, fays Mr. Miller, the rawnefs of this water, when frefh drawn, is not agreeable to the growth of vegetables.

The fize of this garden fhould be in proportion to the wants of the family; but with a much larger allowance of ground than is ufually allotted, in order that the plants may be benefited by ftirring the earth between them whilft they grow. The great and manifeft advantages of this practice, efpecially in the culture of pulfe and garden plants, have been fo evidently fhewn by numbers of experiments related in the former parts of this work, that I cannot but again recommend it here as an object of high importance.

It fhould be inclofed with a wall, either of brick or ftone; but brick is beft, for the greater conveniency of nailing up the fruit-trees which are to be planted againft it. The thicknefs of thefe walls fhould be proportioned to their height, which fome run up to twelve or fourteen feet, or more: but nine or ten will be enough for almoft any kind of fruit; and in this cafe thirteen inches, that is to fay, a brick and an half, will be a fufficient thicknefs; though two bricks will be better, for duration. Their infide fhould be built as fmooth as poffible, and, to ftrengthen them againft high winds, piers fhould be run up with them, at the diftance of about twelve or fourteen feet from each other, according to the ufual extent of the fruit-trees for which they are intended. As to pears, which fpread very wide, and frequently grow much above the height here mentioned, they do not require the affiftance of a wall; unlefs it be fome of the lateft winter forts, and thefe the curious, who will be at the expence, may plant againft walls built on purpofe for them. Thefe piers may project fix or eight inches on the outfide of the wall, for the fake of greater folidity; and they fhould advance about four inches on the infide, for the convenience of fixing to them trellifes, by building the wall on arches; and planting the trees at thofe arched places, as Mr. Hitt advifes, the trees will be thereby enabled to extend their roots underneath the wall; which will prove very advantageous to their growth.

If the quantity of walling which furrounds the kitchen garden be too little to furnifh the defired fupply of fruit, a crofs wall may be built through the middle of this ground; or, where the fize of the garden will admit of it, there may be two crofs walls: but thefe walls muft not, by any means, be lefs than eighty or an hundred feet afunder. More will be yet better.

Mr. Miller is clearly of opinion that the beft afpect for walls in England, is to have one point to the eaftward of the fouth; becaufe thefe will enjoy the benefit of the morning fun, and be lefs expofed to the weft and fouth-weft winds (which are very injurious to fruits in this country) than thofe which are built due fouth. "I know, fays he, that many perfons object to the turning of walls the leaft point to the eaft, on account of the blights which they think come from that quarter in the fpring: but from many years experience and obfervation, I can affirm, that blights as often attack thofe walls which are open to the fouth-weft, as thofe which are built to any other afpect; and I believe thofe who will be at the trouble of obferving for feven years, which afpected walls fuffer moft from blights, will find thofe which are built with a point to the eaftward of the fouth, as feldom blighted as thofe which are turned to any other afpect; therefore in the contrivance of a kitchen garden, there fhould be as great a length of thefe walls built as the fituation of the ground will admit.

" The next beft afpect is due fouth; and the next to that fouth-eaft, which is preferable to the fouth-weft, for the reafons before affigned: but as there will, for the moft part, be fouth-weft and weft walls in every garden, thefe may be planted with fruits which do not require fo much heat to ripen them, as thofe defigned for the beft walls; but wherever there are north walls, thofe will only be proper for baking-pears, plums, and morello cherries for preferving; or fome duke cherries may be planted againft thefe walls, to fupply the table till peaches, nectarines, and plums are ripe."

In whatever manner the wall are made, this garden fhould be well fheltered from the north and north-eaft, by a diftant plantation of high timber-trees, if nature has not otherwife provided a fufficient defence from thofe quarters.

In the diftribution of this garden, particular care fhould be taken to lay the walks out fo as to obtain the greateft convenience that can be for fupplying each part of it with manure and water, and as eafy accefs as poffible to its different quarters, which may be furrounded by a border planted with efpaliers. The manner of forming efpaliers will be directed when we come to fpeak of the training of fruit-trees.

Thefe walks fhould be firm enough to bear at leaft the weight of a loaded wheel-barrow, and wide enough for the convenient carriage of whatever there may be occafion to bring into this garden, or to carry out of it. Mr. Miller is againft making them of gravel; becaufe, as it will very often be neceffary to wheel manure, water, &c. upon them, they would foon be torn up and rendered unfightly; unlefs care be taken that the wheel be broad; or rather that it be a roller as wide as the diftance between the fides of the wheel-barrow.

For the fame reafon he rightly condemns turf-walks here, and advifes, as the beft for a kitchen garden, thofe which are laid with a binding fand. In effect, thefe are the eafieft kept of any: for when either weeds or mofs begin to grow, fcuffling of them over with a Dutch hoe in dry weather, and raking them over a day or two after, will render them as clean as when they were firft laid: or if they are covered with duft taken from great roads, this will bind and become very firm.

If the foil is ftiff and apt to retain water, narrow underground drains fhould be made by the fides of the walks, to carry off that wet: and where the ground is naturally moift, lime rubbifh, flints, chalk, or any other fuch material as can be procured with the leaft expence, fhould be laid at the bottom of thefe walks; or if neither of thefe can be had, the fand fhould be laid thick upon a bed of heath or furze, and the water will drain through this, fo that the walks will be firm and good in all feafons.

The fame means will alfo help greatly to drain away the fuperfluous moifture of the whole ground, if the foil fhould be naturally too wet; for if they are not fufficient, more under-ground drains may be made acrofs different parts of the garden, according to its declivity: for moft kitchen plants are hurt by too much moifture in winter; and trees never produce good fruit when their roots lie in water.

If each quarter of the kitchen garden is to be encompaffed by efpaliers, the walks which divide thofe quarters fhould be wide enough to afford admittance to the warmth of the fun, and to a free current of air. In this cafe they may be, as Mr. Miller directs, fix feet wide in fmall gardens, and ten or twelve in extenfive grounds. On each fide of thefe walks, the efpalier fhould be planted in a border four or five feet wide; by which means the two efpaliers will be far enough afunder for their roots never to injure one another. Thefe borders may be fown with fmall fallading, or any other herbs that do not continue long or root deep; fo that no ground need be loft, and the continual ftirring and manuring of it for thefe productions will be of great fervice to the roots of the trees.

The borders along the fouth and other walls that have a good expofure fhould, in the opinion of this experienced gardener, be at leaft eight or ten feet wide, in order to allow the roots of the fruit-trees that are planted againft them full room to extend themfelves. Such of thefe as face the fouth may be fown for early crops of plants which do not root deep, and thofe that are expofed to the north will do for late crops: but no deep rooting plant, efpecially peafe and beans, fhould ever be placed too near the trees; though moft gardeners are apt to tranfgrefs greatly in this refpect, as well to preferve their crops in winter, as to bring them forward in the fpring: both which ends might be anfwered equally well, and without prejudice to their fruit-trees, by making reed hedges in fome of the warmeft quarters, and fowing clofe to them their early peafe, beans, &c. if fuch fences are found to anfwer the purpofe of forwarding their growth.

It is a general opinion, that plants which are fheltered by walls, fo as to be defended from nipping winds, and to have the additional warmth of the reflected heat of the wall, are leaft liable to be deftroyed by the winter's frofts; for which reafon it is that early crops are moft commonly in borders fo fituated. The fun will undoubtedly give greater motion to the fap of plants there, and they may, for this reafon, feem to be the ftronger. But if we confider, that the walls yield no protection againft the feverity of the night's froft, and that the effect of this froft muft be moft feverely felt by plants whofe fap is in the greateft motion; we may rather fear that this fituation, inftead of being beneficial, may, in fact, counter-act the very end propofed. To be fatisfied of this fact, a gentleman fowed fome early peafe in a border at the foot of a fouth wall, and at the fame time fome others, of the fame fort, in an open field adjacent to to the garden; and he found, that the latter were by much the leaft damaged by the winter's frofts; nor did he perceive any great difference in the feafon of their blooming.

A fquare, or an oblong form, will be moft agreeable to the eye: but it matters not, in other refpects, what fhape this garden is of; efpecially as all grofs irregularities may eafily be hid in the laying of it out. Thus, when this is done, any of the flips cut off by the garden-wall, may, if large enough, and well expofed to the fun, be fet apart for a place to make hot-beds for early cucumbers, melons, &c. One would wifh this fpot to be as near as poffible to the ftables, for the convenience of fupplying it with dung; and to have it without the wall is certainly moft eligible, becaufe that will fave a great deal of filth and litter in the garden, and remove from the nofe and eye an object which is not of the moft pleafing kind. If this flip is long enough to admit of an annual fucceffion of new beds during two or three years, they will be much better than when they are continued more than one year on the fame fpot: and as it will be abfolutely neceffary to fence this melon ground, as it is called, round with a reed hedge, this may be fo contrived as to be moved away in pannels, in fuch manner that there will be no occafion to fhift any thing more than one of the crofs partitions, or fences, each year.

The importance of the precept particularly here, will juftify our mentioning again, that the dunghill, fet apart for this, or for any other purpofe of gardening, or agriculture, ſhould be carefully kept clear from weeds: for if weeds are ſuffered to ſcatter their ſeeds upon the dung, they will be brought into the garden, or other cultivated ground, ſhoot up, damage every crop of uſeful plants, and occaſion a perpetual labour to extirpate them.

Another caution which Mr. Miller gives, as abſolutely neceſſary to be obſerved, is, to carry off all the refuſe leaves and ſtumps of cabbages, the ſtalks of beans, and haulm of peaſe, as ſoon as they have done bearing; becauſe the ill ſcent which moſt people complain of in kitchen gardens is wholly occaſioned by theſe things being ſuffered to rot upon the ground. The leaves of cabbages may be given to hogs, or other animals, while they are freſh, and the reſt of this traſh may be thrown upon the dunghill, which it will help to enrich; or ſuch as will keep may be preſerved, to be thrown in the bottom of the trenches, in that part of the garden which is to be trenched the following autumn.

I muſt here point out a too common neglect of moſt gardeners, which is, the letting of their plants remain on the ground till they have ripened their ſeeds, and wither; not conſidering that whilſt a plant is full of ſap, it preſerves the earth in a looſe ſtate, probably by means of the moiſture perſpired from its roots; but that, when permitted to ſtand till its ſeed is ripe, or the plant withers, it then leaves the impoveriſhed earth dry and hard; being itſelf become entirely void of ſap.

The moſt important points of general culture here conſiſt in good digging, keeping the ground clean, manuring the ſoil, and allowing proper diſtances between the plants, according to their ſeveral kinds and growths. But as the various productions of the kitchen, and thoſe of the fruit, garden require very different treatment, though in the ſame incloſure, it will be right to conſider them ſeparately.

The kitchen garden, if it be rightly managed, is the moſt uſeful and moſt profitable ſpot of ground that either the country gentleman, or the huſbandman, can cultivate. It is indiſpenſably neceſſary to every family in the country, where, the neareſt market town being frequently far off, but poorly furniſhed with plants and roots, and that only on certain ſtated days, perhaps not oftener than once a week, there is no other way to have a variety, or even a ſufficiency, of this exceedingly healthful food, one of whoſe great excellencies conſiſts in its being freſh gathered.

Two eſſential rules to be obſerved in the general management of a kitchen garden are, never to crowd the ground with more plants than it is able to nouriſh properly; and never to let any part of it remain unoccupied, for want of a due ſucceſſion of crops. By this means the maſter, whom I would adviſe always to be his own gardener, at leaſt ſo far as perſonally to direct and ſuperintend whatever is done, may have his table conſtantly ſupplied with ſuch vegetables as he likes beſt, no part of his ground will lie uſeleſs, and each of its products will be brought to perfection.

GARGET, or *Gargol*, a diſtemper incident to hogs; and is known by the creature's hanging down of his head, and carrying it on one ſide, moiſt eyes, ſtaggering, and loſs of appetite.

It is occaſioned by a corruption of the blood, engendered by the eating of rotten fruits, garbidge, carrion, or rank graſs, wherein is much hemlock, &c.

In order to cure this diſeaſe, let the creatures be firſt blooded both under the tail and under the ears, and then the following drink given them:

> Take of chamber-lye one pint; rue and ſouthernwood, cut ſmall, of each a handful; wood-ſoot from an oven, and common ſalt, of each a ſpoonful; hen's dung, near two ſpoonfuls; flowers of brimſtone one ounce: ſtir the whole together, and give two or three horns to each, proportional to their ſize. It is alſo good for a cow to cure the gargal or murrain.

Or you may uſe the following drink in the room of the above;

> Take angelica, rue, ſtavewort, or hog's madder, and May-weed, of each one handful; ſhred them very ſmall, and boil them very well in a pint of milk; and when it is cold enough, add to it a pennyworth of ſallad-oil, and the ſame quantity of treacle. *Mortimer's Huſbandry, vol.* I. *pag*. 250.

GARLICK, a well known plant, cultivated in gardens, and eaſily propagated by parting the cloves, or ſmall bulbs of its root, and planting them in the ſpring, about four or five inches aſunder. They will thrive in almoſt any ſoil or ſituation; but in rich ground their increaſe will be ſurprizing. About the beginning of June their leaves ſhould be tied in knots, to prevent their ſpindling or running to ſeed; and this will alſo tend to enlarge their bulks. As ſoon as their leaves begin to wither and decay, which will be about the middle of July, the roots ſhould be taken up, and kept dry for uſe.

There is a wild ſort of garlick, called crow-garlick, or cow-garlick, that often does great damage to corn in dry ſandy grounds, but will not, according to Mr. Liſle, grow in clays. That gentleman tells us, that he knew a farmer in ſome of whoſe fields it grew in ſuch abundance, that his wheat taſted ſtrong of it, and was thereby damaged from ſixpence to a ſhilling in the buſhel. *Liſle's Huſbandry, vol.* II. *pag*. 313.

GARTH, a yard, a backſide, a croft.

GARNER, a granary, or repoſitory for corn.

GARZIL, hedging wood.

GATE, a frame of timber upon hinges to give a paſſage into incloſed grounds.

GATEWAY, the paſſage through gates of incloſed grounds.

GATTERIDGE-TREE, prickwood.

GAVEL, a row, or ſwarth of corn cut down with the ſcythe.

GAVEL, is alſo a provincial word, ſignifying ground.

GAVEL-KIND, a cuſtom whereby the lands of the father are equally divided at his death among all his ſons.

GAVELOCK, a pitch, or iron-bar for entering ſtakes into the ground.

GEESE, birds too well known to need any deſcription here. They are very profitable to the farmer many ways, for their fleſh, their feathers, and their greaſe. They will live upon commons or any ſort of paſtures, and need very little care or attendance; only they ſhould have plenty of water. The largeſt geeſe are reckoned the beſt: but there is a ſort of Spaniſh gooſe, that is a much better layer and breeder than the Engliſh, eſpecially if the eggs are hatched under an Engliſh gooſe.

Geeſe lay in the ſpring, the earlier the better; becauſe of their price, and their having a ſecond brood. They commonly lay twelve or ſixteen eggs apiece. You may know when they will lay by their carrying ſtraw in their mouth; and when they will ſit, by their continuing on their neſts after they have laid. A gooſe ſits thirty days; but if the weather be fair and warm, they will hatch three or four days ſooner. After the goſlins are hatched, ſome keep them in the houſe ten or twelves days, and feed them with curds, barley-meal, bran, &c. and after they have acquired ſome ſtrength let them out four or five hours a day, taking them in again till they are big enough to defend themſelves from vermin. Others put them out at firſt, and perhaps ſucceed as well as the former. One gander will be ſufficient for five geeſe.

If you would fat green geeſe, you muſt ſhut them up when they are about a month old, and they will be fat in about a month more. Be ſure to let them have always by them, in a ſmall rack, ſome fine hay, which will much haſten their fatting. But for fatting of older geeſe, it is commonly done when they are about ſix months old, in or ſoon after harveſt, when they have been in ſtubble fields, from which food ſome kill them, which is a good way. But thoſe who are deſirous of having them very fat, ſhut them up for a fortnight or three weeks, and feed them with oats, ſplit-beans, barley-meal, or ground malt mixed with milk; but the beſt thing to fatten them with is malt mixed with beer. You muſt however obſerve in fattening all ſorts of water-fowl, that they uſually ſit with their bills upon their rumps, where they ſuck out the greater part of their moiſture and fatneſs, at a ſmall bunch of feathers, which you will find ſtanding upright

on

on their rumps, and always moist, with which they trim their feathers, which renders them more oily and slippery than the feathers of other fowls, and causes the water to slip off them. If therefore these upright feathers are cut away close, they will become fat in less time, and with less meat than otherwise. Geese will likewise feed on, and fatten well with carrots cut small and given them; or if you give them rye before, or about Midsummer, it will strengthen them, and keep them in health, that being commonly their sickly time.

In some countries they shear their geese for feathers, and some pull them twice a year; but the latter is more injurious to them, and therefore it is better staying till their moulting time, and till their death, for the feathers. *Mortimer's Husbandry, vol.* I. *pag.* 255.

GELDING, a castrated animal. For the method of gelding horses, *see the article* HORSE.

GELT-GIMMER, a barren ewe.

GEOFF, or *Goffe*, a mow of hay or corn.

GERMINATION, the act of sprouting or shooting; growth.

GERMINS, buds, tender shoots.

GIGGS, small swellings, or bladders on the inside of the lips and palate of a horse.

They are cured by slitting them open with a knife or lancet, and washing them afterwards with salt and vinegar.

GILL, a rivulet, a beck. It is also a name for ground-ivy, or ale-hoof.

GIMMER-LAMB, or *Gammer-Lamb*, an ewe-lamb.

GLANDERS, a very obstinate and loathsome disease incident to horses.

The cause and seat of the glanders has till lately been so imperfectly handled, and so little understood by the writers on this distemper, that it is no wonder it should be ranked among the incurables: but a new light having been thrown on this whole affair by the study of M. La Fosse, the king of France's farrier, who has been at the pains to trace out, and discover, by dissections, the source and cause of this disorder, we hope the method he has proposed, with some further experiments and improvements, will soon bring to a certainty of cure (in most cases at least) a distemper so dangerous to our horses, and that hitherto has eluded the force of art.

Before we make mention of this work, which has the approbation of the Royal Academy of Sciences, it will not be unacceptable to our readers, we apprehend, to have a more particular account of the symptoms of this disorder from M. La Fosse, that we may the better judge of the merit of our author and his discoveries.

This gentleman then has distinguished seven different kinds of glanders, four of which are incurable:

The first proceeds from ulcerated lungs, the purulent matter of which comes up the trachea, and is discharged through the nostrils, like a whitish liquor, sometimes appearing in lumps and grumes. In this disorder, though the matter is discharged from the nostrils, yet the malady is solely in the lungs.

The second is a wasting humour, which usually seizes horses at the decline of a disease, caused by too hard labour; this defluxion also proceeds from the lungs.

The third is a malignant discharge, which attends the strangles sometimes, and falls upon the lungs, which runs off by the nostrils.

The fourth is, when an acrimonious humour in the farcy seizes these parts, where it soon makes terrible havock.

The fifth kind we shall describe by and by, as arising from taking cold.

The sixth kind is a discharge from the strangles, which sometimes vents itself at the nostrils.

These are the various disorders which have been observed sometimes to throw matter out from the nostrils; let us now describe the real glanders:

The matter then discarged from the nostrils of a glandered horse, is either white, yellow, or greenish, sometimes streaked, or tinged with blood; when the disease is of long standing, and the bones are fouled, the matter turns blackish, and becomes very foetid; and is always attended with a swelling of the kernels or glands under the jaws; in every other respect the horse is generally healthy and sound, till the distemper has been of some continuance.

It is always a bad sign, when the matter sticks to the inside of the nostrils, like glue or stiff paste; when the inside of the nose is raw and looks of a livid, or lead colour, when the matter becomes bloody, and stinks, and when it looks of an ash colour. But when only a limpid fluid is first discharged, and afterwards a whitish matter, the gland under the jaw not increasing, and the disorder of no long continuance, we may expect a speedy cure; for in this case, which arises from taking cold, after a horse has been over-heated, the pituitary membrane is but slightly inflamed, the lymph in the small vessels condensed, and the gland overloaded, but not yet ulcerated.

From these symptoms and some observations made both by Bracken and Gibson, it is plain they were not absolute strangers to the seat of this disorder, though they neglected pushing their inquiries to the fountain-head, and consequently were at a loss to know how to apply the remedy to the parts affected.

But our author, after examining by dissection the carcases of glandered horses, and making a strict scrutiny into the state of the viscera, assisted for that purpose by ingenious and expert anatomists for ten years together, affirms this disease to be altogether local; and that the true seat of it is in the pituitary membrane, which lines the partition along the inside of the nose, the maxillary sinusses or cavities of the cheek-bones on each side the nose, and the frontal sinusses or cavities above the orbits of the eyes; that the viscera, as liver, lungs, &c. of glandered horses are in general exceeding sound; and consequently that the seat of this disorder is not in those parts, as has been asserted by most authors; nor indeed is it probable it should: for how could such horses preserve their appetite, their good appearance, sleek and shining coats; in a word, all the signs of health for many years together (which many glandered horses are known to enjoy) with such distempered bowels?

But on nicely examining the heads of such horses, he found the cavities above-mentioned, more or less, filled with a viscous slimy matter, the membrane which lines both them and the nostrils inflamed, thickened, and corroded with sordid ulcers, which in some cases had eat into the bones. These sinusses or cavities will be better understood by referring to the annexed plate.

He observes, that when glandered horses discharge matter from both nostrils, both sides of the membrane and cavities were affected; but when they ran at one nostril only, that side only was found distempered.

It is a curious remark of our author, that the sublingual glands, or the kernels situated under the jaw-bone, which are always swelled in this distemper, do not discharge their lymph into the mouth, as in man, but into the nostrils; and that he constantly found their obstruction agreed with the discharge; if one gland only was affected, then the horse discharged from one nostril only; but if both were, then the discharge was from both.

He sometimes, though rarely, found the boney partition of the nose carious or rotten; but that the spongy bones about this part must suffer from the acrimony of matter long pent, is not at all to be doubted, though the more solid ones may escape.

The seat of this disorder thus discovered, our author, with great ingenuity, has paved the way for cure, by trepanning these cavities, and taking out a piece of bone, by which means the parts affected may be washed with a proper injection; and, in fine, the ulcers deterged, healed, and dried up.

But as from the observations since made by this gentleman, there are different species of the glanders; so the cure of the milder kinds may first be attempted by injections and fumigations. Thus, after taking cold, should a horse for fifteen or twenty days discharge a limpid fluid, or whitish matter from one or both nostrils, the glands under the jaw rather growing harder than diminishing, we may expect it will degenerate into a true glanders: to prevent which, after first bleeding, and treating him as we have directed for a cold, let an emollient injection, prepared with a decoction of linseed, marshmallows, elder, chamomile flowers, and honey of roses, or such like, be

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thrown up as far as poſſible with a ſtrong ſyringe, and repeated three times a day: ſhould the running not leſſen, or be removed in a fortnight by the uſe of this injection, a reſtringent one may now be prepared with tincture of roſes, lime-water, &c. and the noſtrils fumigated with the powders of frankincenſe, maſtich, amber, and cinnabar, burnt on an iron heated for that purpoſe, the fume of which may eaſily be conveyed through a tube into the noſtrils.

This method has been found ſucceſsful when uſed in time; but the methods of cure depend on the ſtubbornneſs of the diſorder; and, when inveterate, recourſe muſt be had to the operation above deſcribed.

This operation he has performed on three horſes, two of whom diſcharged from one noſtril only, and the third from both; the two firſt he trepanned on that ſide of the head which was affected, and to the other he performed it on both, and found that the wound and perforation filled up with good fleſh in twenty-ſix days, and the horſes ſuffered no inconvenience from the operation; though after this experiment they were put to death.

The directions and orders of the civil government of France, which hinder people from keeping glandered horſes, long prevented M. La Foſſe repeating his attempts, and puſhing his experiments further; but it is to be hoped that ſo uſeful a project will be purſued to its utmoſt extent, as it ſeems ſo promiſing in the execution, and is ſo important in its conſequences: to which end we ſhall beg leave to animadvert on what has been ſaid, and offer our opinion both in relation to the diſeaſe, the operation, and the manner of conducting the cure.

In order to prove that a great inflammation of the pituitary membrane is always the cauſe of the glanders, M. La Foſſe has attempted to bring on an inflammation upon the ſame membrane, by a corroſive injection; and when the injection was only thrown into one ſide, the maxillary lymphatic glands were ſwelled on the ſame ſide, and that noſtril only produced the diſcharge; but when both noſtrils were injected, theſe ſymptoms appeared on both ſides. This gentleman has alſo obſerved, that the bone of the maxillary ſinus being broke by the kick of another horſe, the uſual ſymptoms of the glanders ſoon appeared, from the inflammation the petuitary membrane ſuffered on the occaſion.

The original ſource and cauſe then of this diſorder ſeems to be an inflammation in the glands, and membrane that lines the noſtrils and theſe cavities, which, if not diſperſed in time, will form matter, and ulcerate and erode the bones, for want of a free diſcharge to unload the cavities, and of proper applications to cleanſe and deterge the ulcers: violent colds, or a feveriſh tranſlation ſettling here, may alſo occaſion the ſame complaint, and are probably the general cauſes.

There is a diſorder in men called *Ozæna*, that has great ſimilitude to this in horſes, and ariſes from an inflammation in the maxillary ſinuſſes, or cavities in the cheek-bones, from whence enſues a collection of matter, which, when the cavity is full, or the head properly inclined, runs over into the noſe, and would conſtantly diſcharge thence like a glandered horſe, was the head continued in the ſame poſition. The ſurgical cure is the taking out one or more teeth from the upper jaw, and perforating the cavity with a proper inſtrument, in order to make a depending orifice for the matter to flow through; and to make way for ſyringing the parts affected with proper injections, which in this caſe are thrown through the cavity into the noſe.

The ſimilarity of theſe two caſes, with the method of cure, and the ſucceſs attending the ſurgical treatment (which was firſt invented and perfected by our countrymen Drake and Cowper) undoubtedly gave the firſt hint for trepanning, and ſyringing theſe cavities in horſes; and it is moſt probable, that when the operation is attempted in time, before the bones become rotten, it will be attended with equal ſucceſs; but after opening the cavities, ſhould it by probing be diſcovered, that the bones are in that ſtate, the beſt way then would be to diſpatch the horſe, to prevent unneceſſary trouble and expence.

The parts fixed on for applying the trepan are pointed out in the plate, and the manner of ſawing out the bone will eaſily be underſtood by a view of the inſtrument, and the explanation annexed.

The perforations being made, our next buſineſs is to prevent their filling up too faſt, as it may be neceſſary to keep them open for ſome weeks before a cure can be affected; for which purpoſe, after the uſe of the injection, let the upper one be filled up with a piece of cork, waxed over, and adapted exactly to its ſize, the lower one may be kept open with a hollow leaden tent, through which there will be a conſtant drain of matter from the ſinus's, which will be greatly favoured by this depending orifice, and both be detained by a proper bondage.

If this method ſhould not prevent the granulations, or ſhoots of the fleſh, from filling up ſo faſt as to choak up the perforation, and by that means hinder the injections paſſing freely, they muſt be ſuppreſſed by rubbing with cauſtic medicines, or touching with the actual cautery; as may alſo the bony edges, which, by obliging them to exfoliate or ſcale off, will retard the healing.

The injection firſt made uſe of, ſhould be of a deterſive nature; as a decoction of birth-wort, gentian, and centaury; to a quarter of which, if two ounces of Ægyptiacum and tincture of myrrh are added, it may be as proper as any; and when the diſcharge is obſerved to abate, and the colour alter to a thick white matter, the injection may be changed for barley-water, honey of roſes, and tincture of myrrh; and, finally, to dry up the humidities, and recover the tone of the relaxed glands, Bates's allum-water, or a ſolution of colcothar, vitriol, lapis medicamentoſus, or ſuch like, in lime-water, will moſt probably complete the cure. Dr. Bracken recommends the following:

> Take of allum and white vitriol powdered, of each four ounces, calcine them in a crucible when cold, powder the calx, and mix it with a gallon of lime-water, and a quart of vinegar, decant the clear for uſe.

But whoever is at all acquainted with practical ſurgery, well knows, that without the aſſiſtance of internals, eſpecially in glandular diſorders, the cure is not ſo eaſily effected, nor rendered compleat or laſting: we therefore adviſe a ſtrong decoction of guaicum chips to be given every day, to a quart or three pints, throughout the cure, and when the matter leſſens, to purge at proper intervals, and put a rowel into the horſe's cheſt, in order to divert the fluids from their old channel; if theſe ſhould not ſucceed, mercurials may be given with the phyſic, and the alterative powders with lime-water may be taken for a time, if the horſe is worth the expence.

An Explanation of the Heads and Trepan. See Plate XVII. *Fig.* 2.

B. B. two lines repreſenting the bounds of the cerebellum, or back part of the brain, which is very ſmall in a horſe, in proportion to that of a man, as well as the brain itſelf, which commences from the line D.

C. C. a line where the ſuperior part of the ſinus frontalis commences, together with a view of the bottom of the ſinus, which terminates between the lines D and E, where there appears a ſubſtance in the form of a pear, which is the os ethmoides, or ſieve-like bone, through which the olfactory nerves paſs, by which the pituitary membrane receives its ſenſibility, and the ſenſe of ſmelling is performed.

E. repreſents the beginning of the maxillary ſinus, which terminates at M.

The ſhaded ſpace, which may be obſerved between theſe two lines, repreſents the great cavities. The oblique ray marked F, is a bony partition, which ſeparates this ſinus into two parts, that have no communication; and ſometimes it happens (though but rarely) that there are two bony partitions; and for this reaſon they are repreſented by the lines marked F and G. It alſo ſometimes happens (but ſtill more ſeldom) that there are horſes, in whoſe heads we do not find any of theſe bony partitions.

N. points out the place of the cornets or horns. O the redoublings. P their middle part. Q the inferior part of them. M the bony canal or pipe which guards the maxillary nerve.

A. A.

A. A. the feptum narium, or partition, which divides the nofe from top to bottom, and conftitutes the two noftrils.

L, in the head that is intire, points out where the trepan fhould be applied on the frontal finus, when we have reafon to believe the glanders is fpread into this finus. However, I think it fafeft to apply it firft on E, for the reafons mentioned in the next explanation, and becaufe the brain may be endangered, fhould the finus be miftook.

E, the place where the trepan may be applied, in order to cleanfe the maxillary finus. The round mark between D and E (which is the impreffion of the trepan) is, however, on experience, preferred by the author, as the propereft place, as one orifice would then be fufficient to wafh all the parts, both above and below, with the injection.

But in general, when the maxillary finus only is affected, penetrate but the upper part, where the fyringe points, or thereabouts, and your expectations will be anfwered; fhould they not, there feems fo little danger in the operation, that you may again perforate at the places above mentioned, higher up. But a proper number of experiments will foon fettle this point with certainty.

H, in the head that is intire, points out the place where another hole, or perforation fhould be made, as a drain to give iffue to the glanderous matter wafhed away by the injection which could not be difcharged without fuch a depending orifice; and perhaps this perforation alone, in many recent cafes, would be fufficient, provided the injection paffed freely upwards, and the hole was kept open by means of a hallow leaden pipe conftantly retained in it for that purpofe, and to procure a free paffage for the matter.

I, reprefents the injection pufhed in by the fyringe, which flows out by the orifice and the noftril K; during the ufe of the fyringe, it is neceffary to hold the noftrils clofe.

If, in the maxillary finus, inftead of one there happens to be two bony partitions, it is abfolutely neceffary to pierce through them both, by means of a ftiletto, or fharp-pointed tuck, as in the manner reprefented in the cut of a horfe's head opened, though this conformation feldom occurs.

As thefe bony partitions may in fome particulars vary, fhould the ftiletto not have the defired effect, and the injection thrown in by the fyringe not come out at H; in fuch cafe the liquor fhould be injected upwards, through the orifice made by the ftiletto or trepan at H.

As in young horfes the frontal and maxillary finuffes are very fmall, it will be proper to direct the trepan towards the interior part of the nofe, otherwife the inftrument might work upon the roots of the teeth, which incline towards the finus, and would in fuch cafe be an infurmountable obftacle to the operation.

R, the inftrument or trepan. S, the handle which turns it. T, the faw-part to be applied to the bone.

From a view of this inftrument, the manner of working it will appear fimple and eafy; the cooper's managing his wimble being a proper directory.

The inftrument called the trephine, which is chiefly ufed by our Englifh furgeons in perforating the fkull, will equally anfwer this purpofe; and if any difficulties fhould arife, notwithftanding this defcription, the gentlemen of the faculty will foon make it familiar and intelligible.

Before the application of the trepan, or trephine, it is quite neceffary to obferve, that a circular piece of the fkin fhould firft be cut off, with the membrane which covers the bone, about the fize of a half crown piece, in order to make the inftrument work the eafier, and to prevent the inconveniencies which might arife from the external wounds healing up too faft.

The fyringe fhould be large enough to contain half a pint of injection.

GLANDIFEROUS, an epithet applied to fuch trees as bear maft or acorns. Thus the oak, beech, &c. are called glandiferous trees.

GLEANING, the action of picking up the ears of corn left behind by the gatherers.

GLEBE, properly fignifies the foil or ground in general; but is particularly applied to the land poffeffed as part of the revenue of an ecclefiaftical benefice.

GLEBOUS, or *gleby*, turfy.

GLEDE, a kite.

GLEN, a valley, a dale.

GLYSTER, or *Clyfter*, a medicine injected into the anus of an animal.

Glyfters are often neceffary for horfes in various diforders, and may be reduced to thefe different kinds, viz. laxative and emollient, purgative and reftringent.

But it fhould be obferved, that before the adminiftration of emollient glyfters in coftive diforders, a fmall hand well oiled fhould be paffed up the horfe's fundament, in order to bring away any hardened dung, which otherwife would be an obftacle to the clyfter's paffage.

A bag and a pipe of a proper form, is to be preferred to a fyringe, which throws up the clyfter with fo much force, that it often furprizes a horfe, and makes him reject it as faft as it goes in: whereas the liquor, when preffed gently from the bag, gives him no furprize or uneafinefs, but paffes eafily up into the bowels, where it fometimes remains a long time, and is extremely ufeful, by cooling and relaxing them; and will fometimes incorporate fo with the dung, as not eafily to be diftinguifhed from the other contents of the guts. Thefe emollient clyfters are extremely ferviceable in moft fevers, and greatly preferable to purging ones; which in general are too pungent, and ftimulate too much, efpecially if aloes are a part of the compofition.

Nutritive clyfters are very neceffary, and often fave a horfe from ftarving, when his jaws are fo locked by convulfions, that nothing can be conveyed by the mouth.

They fhould not exceed a quart or three pints at a time, but be often repeated: nor fhould they be too fat; but made of fheeps heads, trotters, or any other meat broths, milk-pottage, rice-milk ftrained, and many other fuch nourifhing things. For an emollient clyfter take the following:

> Take marfhmallows and chamomile flowers, each a large handful; bay-berries and fweet fennel-feeds bruifed, each an ounce, boil in a gallon of water to three quarts, pour off into a pan, and diffolve in it half a pound of treacle, and a pint of linfeed oil, or any common oil.

To make it more laxative, add four ounces of lenitive electuary, or the fame quantity of cream of tartar, or common purging falts.

> Take two or three handfuls of marfhmallows, fenna one ounce, bitter apple half an ounce, bay-berries and annifeed bruifed, each an ounce, falt of tartar half an ounce; boil a quarter of an hour in three quarts of water, pour off, and add four ounces of fyrup of buckthorn, and half a pint of oil.

This clyfter will purge a horfe pretty brifkly; and may be given fuccefsfully, when an immediate difcharge is wanting; efpecially in fome fevers with inflamed lungs, or other diforders, which require fpeedy relief.

But it is neceffary to caution againft a folution of coarfe aloes for this purpofe, as it has been found to gripe horfes violently, and excite feverifh, and fometimes convulfive fymptoms; and indeed all pungent and ftimulating medicines, as the ftronger purgatives generally are, fhould be given in this form with great caution.

But the generality of emollient clyfters may be prepared with much lefs trouble; as two quarts of water gruel, with half a pound of treacle, a pint of oil, and a handful of common falt, will as effectually anfwer every purpofe. The following is a reftringent clyfter.

> Take pomegranate-bark, or oak bark, two ounces; red rofe-leaves, frefh or dry, a handful; baluftines, an ounce: boil thefe in two quarts of water, till one is nearly confumed; then pour it off, and diffolve in it four ounces of diafcordium; to which may be added a pint of Port-wine.

This will anfwer all common cafes, where reftringents are neceffary, but fhould never be given in larger quantities; for the longer clyfters of this kind lie in the bowels, the more efficacious they are. *Bartlet's Farriery, page* 22.

GOAD, a pointed inftrument with which oxen are driven forward.

GOAR-VETCHES, the ſame with ſummer-vetches. *See the article* VETCHES.

GOAT, a genus of animals, the characters of which, according to Mr. Ray, are theſe: that it is covered with hairs, not with wool; that its horns are leſs crooked than thoſe of the ſheep, and that it has a beard hanging down from its chin, and is of a ſtrong ſmell.

It is very ſingular, that this genus of animals are all able to run and climb about the rugged parts of mountains without falling, though their feet ſeem by no means contrived by nature for any ſuch purpoſes.

Goats may be of great advantage to the farmers in ſome parts of the kingdom, as they will live in rocky barren countries, where nothing elſe can get a ſupport for life. They will climb the ſteepeſt rocks, and there browſe upon briars, heath, and ſhrubs of various kinds, which other creatures will not taſte of. They will feed on graſs in paſtures; but, as they love browſing on trees much better, great care muſt be taken to keep them from valuable plantations.

The greateſt advantage of theſe creatures is their milk, which they yield in large quantities; and which is accounted the beſt milk of all animals. They mix this and cows milk together in many parts of the kingdom, and a very valuable kind of cheeſe is made of it. Beſide this, the kids or young goats are very fine food, and the beſt kinds bring forth theſe two or three at a time, and that twice a year.

Goats hair alſo is valuable; it may be ſheared as the wool from ſheep, and is excellent for making ropes that are to be uſed in the water, as they will laſt a great while longer than thoſe made the common way. A ſort of ſtuff is alſo made of it in ſome places. The beſt kind of goats for keeping to advantage ſhould be choſen in this manner: the male ſhould have a large body, his hair ſhould be long, and his legs ſtraight and ſtiff; the neck ſhould be plain and ſhort, the head ſmall and ſlender, the horns large, the eyes prominent, and the beard long. The female ſhould have a large udder, with large teats, and no horns, or very ſmall ones. They ſhould be kept in flocks, that they may not ſtraggle; and they ſhould have good ſhelter both in ſummer and in winter, the heat and cold being both prejudicial to them. They ſhould be coupled in December. They ſhould have no litter in winter, but only a paved floor kept clean. The kids are to be brought up for the table in the ſame manner as our lambs are. They are recommended to lie among horſes, their ſmell, as ſuppoſed, preventing many diſtempers in thoſe cattle. *Mortimer's Husbandry*, *vol.* I. *pag.* 244.

GOD's-GOOD, yeaſt, or barm.

GOFFE, the ſame with geoff. *See* GEOFF.

GOOL, a ditch.

GOOSBERRIES, the name of a well known fruit cultivated in kitchen gardens.

They are propagated either by ſuckers taken from the old plants, or by cuttings. Theſe laſt are by far preferable, becauſe they generally root the beſt, and are leaſt apt to produce ſuckers, which always weaken the ſtock from whence they proceed. The cuttings ſhould be taken from the handſomeſt ſhoots of the beſt bearing branches of the moſt fruitful ſhrubs: they ſhould be about ſix or eight inches long, and ſhould be taken off, and planted, in autumn, juſt before their leaves begin to fall, about three inches deep, in light earth, expoſed to the morning ſun. Their growth will be promoted by watering of them gently in dry weather, and they will be trained up regularly to a ſtrait ſtem, if all their under ſhoots are rubbed off in the ſummer, as ſoon as they appear, ſo as to leave only the uppermoſt or ſtrongeſt. In the next October, theſe plants will be fit to remove into a nurſery, where, after trimming their roots, and cutting off all ſide branches, they ſhould be ſet a foot aſunder in rows three feet diſtant from each other, in an open ſpot of freſh earth, which has been well dug, and cleanſed from all noxious weeds and roots. They ſhould here be faſtened to ſhort ſticks, or ſtakes, the more effectually to render their ſtems ſtrait and upright; they ſhould be cleared from all lateral ſhoots to the height of about a foot above the ſurface of the earth; and after one year's training in this manner (keeping them clear from weeds, and cutting out all croſs branches, ſo that their heads may not become too thick,) they will be fit to tranſplant to the places where they are to remain. The ſoil, for them to thrive to the greateſt advantage, ſhould then be a rich light ſandy earth; though they will do very well in middling ſoils which are not too ſtrong or moiſt, and in all ſituations. However, their fruit is beſt when they grow in an open expoſure, and not within the ſhade of other trees. The beſt ſeaſon for this tranſplanting is likewiſe in October, when their leaves begin to decay; and will alſo be right then to trim their roots again, to diveſt them of all lateral and all croſs ſhoots, and to ſhorten all their long branches, ſo as to make the head regular. The diſtance at which they ſhould be planted now, if there be a large number of them, is eight feet row from row, and ſix feet aſunder in the rows.

The gardeners around London, who raiſe great quantities of theſe buſhes in order to ſupply the markets with their fruit, prune them ſoon after Michaelmas, and then dig up the ground in the above-mentioned intermediate ſpaces, and plant it with coleworts for ſpring uſe. Their ground is by this means employed all the winter, without hurting the gooſberries; and the coleworts ſo planted often eſcape in hard froſts, when others which are leſs ſheltered are often deſtroyed. This huſbandry is well worth practiſing where land is dear, or where perſons are confined for room.

The common practice of clipping the heads of theſe ſhrubs with ſhears, in order to give them a roundiſh form, is very wrong: becauſe they become thereby ſo crowded with wood, that the fruit which they produce never grows then to half the ſize that it would if the branches were properly thinned with a pruning knife, all the miſplaced ones cut away, and the ſtrong bearing ſhoots ſhortened to about ten inches, with care always to prune them off behind a leaf bud. With this management, with keeping the ground clear from weeds, with digging it at leaſt once a year, and with beſtowing a little rotten dung upon it every other year, the fruit will be near twice as large as that which is raiſed in the common way, and the ſhrubs will continue in vigour much longer.

The large white Dutch, the large amber, the early red, and the early green, both of which laſt are hairy, are generally reckoned the beſt ſorts of gooſberries: but many others, known by the names of the perſons who firſt raiſed them from ſeeds, are alſo much eſteemed.

Gooſberries yield in plenty an agreeable and cooling liquor, the firſt luſciouſneſs of which is ſoon carried off by proper fermentation. Some make gooſberry wine without boiling it all, becauſe the boiling gives it a browniſh colour: but the truth is, that it will ſoon become ſour, if it be not depurated from the groſs lee, with which it abounds, by a proper fermentation.

GOOSE. *See the article* GEESE.

GOOSE-GRASS, or wild tanſy, the name of a troubleſome weed very frequent in clay grounds. The beſt method of deſtroying it is to mow it in ſummer, well dung the land, and never plough it out of heart.

GOSS, or *Gorſe*, the furze.

GOULANS, corn-marigolds.

GRAFT, or *Graſt*, a cion or ſhoot of a tree inſerted into another, ſo as to make it yield fruit of the ſame nature with that of the trees from whence the graft was taken.

In the choice of grafts, the following directions ſhould be carefully obſerved: Firſt, That they are ſhoots of the former year. Secondly, That they are taken from healthy fruitful trees. And, thirdly, That you prefer thoſe grafts which are taken from the lateral or horizontal branches, to thoſe taken from the perpendicular ſhoots. Theſe grafts ſhould be cut off from the trees before the buds begin to ſwell, which is generally three weeks or a month before the ſeaſon for grafting; therefore when they are cut off, they ſhould be laid in the ground with the cut downwards, burying them half their length, and covering their tops with dry litter, to prevent their drying: if a ſmall joint of the former year's wood be cut off with the cion, it will preſerve it the better: and when it is grafted, this may be cut off; for the grafts never muſt be cut to a proper length before they are inſerted into the ſtocks; but till then, the ſhoots ſhould remain their full length, as they were taken from the tree, which will preſerve them better from ſtriking. If theſe grafts are to be carried to a conſi-

considerable distance, it will be proper to put their cut ends into a lump of clay, and to wrap them up in moss, which will preserve them fresh for a month or longer: but these should be cut off earlier from the trees than those which are to be grafted near the place where the trees are growing. For the choice of stocks for grafting, *see the article* STOCK.

GRAFTING, or *Engrafting*, is the taking a shoot from one tree, and inserting it into another, in such a manner that both may unite and form one tree.

The reason for grafting is, that as all good fruits have been accidentally obtained from seeds, so these when sown will often degenerate, and produce such fruit as are not worth cultivating; but when the shoots, cions, or grafts, are taken from such trees as yield good fruit, these will never vary from their kind, whatever be the stock, or tree, on which they are grafted.

The most proper season for grafting is in the spring, just before the rising of the sap, or at least before it rises in any great quantity: but the weather must be neither frosty nor wet; nor should the wind blow very bleak or strong when this operation is performed: for on these circumstances, and upon the exact joining of the inner bark of the cion with the inner bark of the stock, so that the sap which flows between the bark and the wood may be communicated from the one to the other, the success of grafting chiefly depends.

The implements necessary for grafting are, a fine small hand-saw to cut off the heads of large stocks; a good strong knife with a thick back to make clefts in the stocks; a sharp penknife to cut the grafts; a grafting chissel, and a small mallet to pare away the wood; bass, or woollen yarn, to tie the grafts with; and a quantity of clay, or cement, properly prepared, to lay over the incisions, in order to prevent their bleeding, and keep out the air.

The method of preparing the clay intended for this purpose, is to mix thoroughly together a quantity of strong, fat loom, some new stone-horse dung broken into small bits, a little tanners hair, or straw, cut very small, with a little salt, and as much water as will make the whole of the consistence of pretty stiff mortar.

The cement or composition which some have of late used, and which has been found to answer the design of keeping out the air better than the above clay, is made of turpentine, bees-wax, and rosin, melted together. This composition, when of a proper consistence, is laid about a quarter of an inch thick, upon the cut part of the stock round the graft; and has this farther advantage over the clay, that there is no danger of its being hurt by frost; for cold hardens it; and when the heat of summer comes on, by which time it is no longer wanted on the tree, it will melt and fall off without any trouble.

Among the several methods of grafting hitherto known, the following are most approved, and generally practised.

Cleft-GRAFTING, called also STOCK, or SLIT-GRAFTING. This is used chiefly for middle sized stocks, from one to two inches in diameter. The season for it is in the months of February and March; and the method, as now practised, is thus:

The head of the stalk being sawn, or cut off, with a slope, smooth and clean, a perpendicular cleft is made therein, about two inches deep, with a strong knife, or chissel, from the top of the slope, as near to the pith as may be without touching it. In this cleft, the grafting chissel, or a wedge, is put to keep it open. The graft or cion is prepared by cutting it aslope, in form of a wedge, to suit the cleft, only leaving a small shoulder on each side; and when cut, it is to be placed exactly in the cleft, so as that the inner bark of the cion may aptly, and closely, join to the inner part of the bark, or rind of the stock; in the dextrous performance of which, the chief part of the art of grafting consists. That side of the cion, which is to be placed outward, at the part where it is cut wedge-wise and inserted into the cleft of the stock, should be much thicker than the other side, the better to facilitate the exact joining of its rind to that of the stock; for if these two do not unite, the graft will not succeed. The rind of the stock chosen for this way of grafting should therefore not be too thick; because it will then be the less manageable. If the cleft pinch too tight, a small wedge may be left in it to bear the stress. As soon as the graft is properly fixed, the cleft should be closely covered over with clay, or, which some think better, with moss, or the fresh bark of a tree bound on with ozier.

When this method, which is the most ancient, and most common, manner of grafting, is used to stocks that are not strong, a ligature of bass should be made around the stock, to prevent the opening of its slit; and the whole should then be clayed over, or covered with the cement before described, to hinder the air from penetrating into the slit, so as to destroy the graft, only two eyes of which should here be left above the clay, for shooting.

The straightest and smoothest part of the stock should always be preferred for grafting, in whatever way this operation is performed.

GRAFTING *in the Rind*, or *Shoulder*-GRAFTING, likewise called slicing and packing, to distinguish it from grafting in the bark, which will next be spoken of, is performed in the following manner, about the latter end of March, or the beginning of April, on more slender stocks than those which are commonly used for cleft-grafting.

The top of the stock is cut off in a smooth, straight place: then the cion, or graft, is prepared by cutting it on one side from the joint, or seam, down slope-wise, making the slope about an inch, or an inch and an half long; and observing it is bent, so that the cion may stand nearly upright when it is fixed to the stock. At the top of the slope, a shoulder is made, whereby it is to rest on the crown of the stock. The whole slope must be plain and smooth, that it may lie even to the side of the stock. The length of the cion used here may be about four inches from the shoulder, for a standard tree; but for a dwarf, or wall-tree, it may be six inches. When the cion is prepared, the outside of its sloped end, from the shoulder downward, is applied to the west, or south-west side of the stock, and its length and breadth measured thereon; which done, the bark of the stock (but not any of its wood) is cut away to those dimensions, that the cut part of the cion may be fitted in as exactly as possible. In doing this, regard must be had to the bigness of the stock, and the thickness of its bark, in order to proportion thereto the length and breadth of the cut part of the cion; otherwise the passages of the sap in the stock and cion will not meet, and the cion will then of course perish. When the cut part of the cion is exactly fitted to, and laid on that of the stock, they are bound together with woollen yarn, and covered with clay an inch above, and as far below, the head of the stock; working it round the cion, till it become sharp at top, that the rain may run down it.

This method has several advantages over the former. Among these are, that the wound heals up sooner, and that, in the mean time, it is in less danger from the weather: that it does less injury to the stocks and grafts, by avoiding all severe splittings and pinchings; that the bark is more easily placed in the passage of the sap here, than in the cleft; that the graft thrives and shoots with greater vigour, and bears sooner in this way than in that; and that it is practicable on smaller stocks than the other, which must have a good body, and consistence, before they can bear cleaving.

GRAFTING *in the Bark* is performed thus. Prepare the stock and cion as for grafting in the rind, both as to time and manner; but, instead of cutting out the bark of the stock, slit it down, on the south-west side, from the top, almost as long as the sloped part of the cion, and at the top of the slit loosen the bark with the point of your knife. Then thrust an instrument, made of very hard wood, ivory, silver, or the like, and formed at the end like the slope-end of the cion, but much less, down, between the bark and wood, to make room for the cion; which being put in, the bark is to be so managed, as that it may close exactly to the stock and edges of the cion, and the whole is then to be bound up, and covered as before.

Whip-GRAFTING, or *Tongue*-GRAFTING, is proper for small stocks, from an inch diameter to a quarter of an inch, or even less. Mr. Worlidge, Mr. London, Mr. Miller, and others, speak of it as the most effectual way of of any, and that which is moſt in uſe, becauſe the cion covers the ſtock much ſooner in this method than in any other; for here the cion and the ſtock muſt always be of the ſame thickneſs. There are three ways of performing it, and all of them may be practiſed ſomewhat later than either of the foregoing.

The firſt is, to ſlope the cion off a full inch, or more; then to do the ſame to the ſtock; and afterwards to tie the one to the other, with baſs or yarn, ſo as to join them cloſely at every part, but particularly at the rind; and then to cover the joint carefully with well tempered clay. The baſs uſed for this, or for any other binding, ſhould be taken from a ſound mat, and be ſoaked in water for ſome hours, to increaſe its ſtrength, and render it the more pliable.

The ſecond way is, to make a ſhoulder in the graft, and, the head of the ſtock being cut off and ſmoothed, to join it as in grafting in the rind.

The third method, which is an improvement of the laſt, is properly named tipping or tonguing. This is done by cutting the ſtock off ſlanting, as before, and leaving at its upper ſide a thin piece, or tongue, as it is called, of the wood, pared away like the lower end of a cion. The cion is then ſloped, and tongued, in the ſame manner as the ſtock, and a ſlit is made in each of them, downward in the ſtock, and upward in the graft, on the ſide oppoſite to the tongue, ſo that each may receive the tongue of the other. The cion is then joined to the ſtock, as cloſely as can be, particularly at the bark; a ligature is made round them with baſs or woollen yarn, and the engrafted part is well covered with clay or cement.

Side-GRAFTING. In this, the cion is prepared as in whip-grafting; but the head of the ſtock is not cut off at the time of performing the operation. Inſtead of that, ſo much of the bark as the cion will cover is pared off from the weſt-ſide of the ſtock; then both the cion and the ſtock are ſlit in the laſt mentioned manner of whip-grafting, and they are bound together, and cloſed up with clay. At the year's end, the top of the ſtock is cut off at the grafted place, ſlopewiſe; and the wound is covered with clay or cement.

Scutcheon-GRAFTING is another method of grafting in the rind, by ſlitting the bark of the ſtock in form of the capital letter T, looſening it with the point of a knife, and inſerting a cion prepared as above. This is practiſed in June, July, and Auguſt; eſpecially if the bark does not part eaſily from the ſtock; and in caſe of failure, it is properly ſupplied by cleft grafting, in the enſuing month of February or March.

Crown-GRAFTING is only practiſed in the larger trees, which are capable of receiving a number of grafts, and are too big to be cloven; for theſe, the head or main branches, being cut off horizontally, four or more grafts are placed round the ſtock, between the bark and the rind, ſomewhat in the manner of a crown. The moſt proper time for performing this is about the latter end of March, or the beginning of April. After the intended number of cions are inſerted, which is done exactly in the ſame manner as that already delivered for grafting in the rind, the whole crown of the ſtock is well clayed over, and only two eyes of each cion are left uncovered; that being ſufficient for their ſhooting.

This method of grafting was more practiſed formerly than it is at preſent; many people having been diſcouraged by the ill ſucceſs that has frequently attended their cions, which have been blown out of the ſtock, by ſtrong winds, after they had made large ſhoots, and even after they had grown there five or ſix years. But this accident may be prevented, by tying the cions to ſtakes faſtened to the tree, till they are ſo firmly fixed, as to have almoſt covered the ſtock.

Root-GRAFTING is a modern invention, the deſign of which is ſomewhat different from that of any of the former methods; this being for the propagation, or multiplication, of plants already fitted to produce their fruit.

To perform this, take a graft, or ſprig, of a young tree, which you intend to propagate, and a ſmall piece of the root of another tree of the ſame kind, or of a like genus, and whip-graft them together; obſerving that the but-ends of the graft and root be well united, and that the rind of the root join cloſely to that of the graft. Theſe may, afterwards, be planted out at pleaſure, and the piece of root will collect the nutritive juices, and feed the graft, as the ſtock does the other way.

This method of propagation is very eaſy and expeditious; roots being more plentiful than ſtocks: by this means the pieces of roots of one crab-ſtock, for example, or of one apple-ſtock, will ſerve for twenty or thirty apple grafts; and the like of other trees. It is alſo an excellent way for raiſing of tender trees, which will hardly bear being grafted in the ſtock. Add, that trees thus grafted bear ſooner, and are more eaſily dwarfed than thoſe done any other way.

The only objection againſt this method is, that the young tree grows but ſlowly at firſt, which is occaſioned by the ſmallneſs of the root that feeds the graft; for in all trees the head muſt follow the increaſe of the roots, from whence it hath its nouriſhment.

Reiterated GRAFTING, or GRAFTING *by a double or triple inciſion*, is another method mentioned by Agricola, whoſe work, though chimerical enough in many reſpects, contains, notwithſtanding, ſeveral good things. To perform this, firſt graft a good cion on a ſtock, and cut it away to one half, or a third part; then fix to that remaining part of the cion another graft, of a better kind; and to that a third; for the oftener the tree is grafted, the finer fruit it produces.

By this method the author above mentioned aſſures us, that he produced muſcat pears, which were admirable, making at firſt uſe of a ſtock grafted with a pound-pear, on which he grafted a ſummer bon-chretien; and when the branch of this laſt had ſhot, he grafted on it a cion of a bergamo, which he alſo cut, and grafted on it a cion of a muſcat pear.

GRAFTING *of branches* is alſo commended by Agricola, as a very certain and profitable operation; beſt practiſed on large, full-grown, and even old trees.

To do this, half or more of the branches muſt be lopped off, and grafts of three or four years old be applied to them, taking care to have ſtakes, or other things, to ſupport them againſt the wind, &c.

He adds, that by this method you will have, perhaps, the ſame year, or at leaſt the ſecond or third, ſuch a quantity of fruit, as the youngeſt and ſoundeſt tree would hardly produce.

GRAFTING *by approach*, called alſo *inarching*, and *ablactation*, is uſed only when the tree intended to be grafted, and that from which the graft is to be taken, ſtand ſo near, or can be brought ſo near to each other, that they may be joined together. The method of performing it is thus: the branch to be inarched is fitted to that part of the ſtock where it is to be joined, the rind, and part of the wood, of one ſide of that branch, is then pared away, very ſmooth and even for the length of three inches, and afterwards the other branch, which is to ſerve for the ſtock to which the graft is to be united, is ſerved in the ſame manner, ſo that the two may join cloſely and equally together, that the ſap veſſels may meet. A little tongue is then cut upwards in the graft, and a ſlit is made in the ſtock to receive it; ſo that when they are joined, the tongue prevents their ſlipping, and the graft is the more cloſely united to the ſtock. When they are thus placed exactly together, they muſt be tied with baſs, worſted, or ſome other ſoft thing; and the place of junction muſt be well covered over with grafting clay, to prevent the air from drying the wound, and the wet from rotting the ſtock. A ſtake muſt alſo be fixed in the ground, and both the ſtock and the graft muſt be tied thereto, to prevent their being diſplaced by the wind. When they have remained in this ſtate four months, they will be ſufficiently united, and the graft may then be cut off from the mother tree, obſerving to ſlope it cloſe to the ſtock. It is of great ſervice to the graft then to lay a freſh coat of clay all round the grafted or joined part. This operation ſhould be performed in April or May, that the graft may be perfectly united to the ſtock, before the enſuing winter. It is chiefly practiſed upon oranges, mirtles, jaſmines, firs, pines, and ſome other trees, which do not ſucceed well in the common way of grafting or budding. But though orange trees are here mentioned among the reſt, this prac-

tice

tice is not to be advised for them, or for any other trees, if they are intended to grow large; for that they hardly ever do in this method; and accordingly it is seldom used but for the curiosity of having a young plant with fruit upon it, in a year or two from its having been raised from the seed. This is, indeed, effected by inarching a bearing branch into a young stock: but the plant so treated seldom lives long.

The walnut, fig, and mulberry, will also take by this method of grafting, though neither of them will succeed in any other way; but still they, like all other trees that are thus managed, will remain weak, and stinted in their growth, besides the shortening of their otherwise usual time of duration.

All grafts, particularly of young cions, are subject to be injured by birds; but that may be prevented by binding some small bushes about the tops of the stocks.

The binding of the grafts, whether it be of bass or yarn, should be loosened at least, if it be not entirely taken off at Midsummer, or thereabouts, lest its then too great tightness (as the stock will have increased in bulk, and the binding, perhaps, have been swelled, and consequently shrunk by the weather) should injure the plant.

Escutcheon GRAFTING. *See* INOCULATION.

GRAIN, a general name for all sorts of corn, as wheat, barley, &c.

GRANARY, a building to lay or store corn in, especially that designed to be kept a considerable time.

Experimental philosophy has proved, that the air is the great source of corruption; keep out that, and all is kept out; and the most corruptible substances, such as meal, butter, milk, and the like, have been preserved fresh four months in the exhausted receiver of an air-pump.

They have, near Grand Cairo, a magazine or granary, defended with good walls, and called Joseph's granaries. It is not probable that they are quite so old as the days of that patriarch; but they abundantly prove the utility of such store-houses, by the vast quantities of grain annually preserved in them.

Many parts of Africa abound with granaries of this kind.

They are so many deep pits made in the solid rock; the descent into them is but just large enough for a man to go down into them; but they grow larger as soon as the person is in by, and are usually square, from thirty to forty feet in diameter. In these the great men of the country preserve their corn; they first strew over the floor with straw, then they lay on the corn, still as the heap rises, placing a thin bed of straw between the corn and the sides, as they did at the bottom. In this manner they proceed till the whole cavity is filled: when this is done, they cover the mouth of the entrance with a sort of hurdle of green boughs of trees, interwoven one with another. This they cover with about two feet thickness of sand, and over this raise a ridge of earth, well beat together, in order to throw off the rain both ways, that none may settle on the place and soak into the magazine.

The corn thus stored up always keeps three, four, or more years very good; and, not unfrequently, the proprietor being taken off by the severity of the eastern governments, under which they live, the magazine is forgotten, and some accident discovering it many years afterwards, the corn is almost always found perfectly good in it. All the care they take, in regard to the corn, is to expose it two or three days to the sun's heat, to dry it thoroughly, before they carry it into the magazine.

In the dutchy of Lithuania, and in the Ukraine, the people always preserve their corn in the same manner in wells or pits made in dry places; but in these countries great care is to be taken in the opening these store-rooms; for if people descend into them before they have had sufficient communication with the fresh air, they are often killed by the damps; this, however, is easily guarded against. By these, and numerous other instances of the practice of other countries, it appears evident, that the advantage of these subterranean granaries over all others is very great.

Though these are to be recommended before all others, yet the common granaries may, with proper care, be rendered greatly more useful than they are at present. The grand caution necessary to this purpose is, to guard against the too great humidity, which there always is in places where there is a great number of doors and windows. A too free access of the external air is also to be carefully guarded against; for this brings in with it the eggs of a vast number of different insects, which prey upon, and destroy the corn. A third caution is, when the corn is the produce of the country where it is preserved, not to fill the place with the crop of one place only, but to mix the harvests of two as different provinces as may be, the one dry, the other moist, or otherwise differing as much as may be; thus the contrary qualities of the one will prevent the destruction of the other. These are the three great rules to prevent the corrupting of corn; but when the mischief is once begun, it will prove very difficult to stop it: all the care that can be employed, should therefore be taken in regard to these.

The two great cautions to be observed in the erecting of granaries, are to make them sufficiently strong, and to expose them to the most drying winds. The ordering of the corn in many parts of England is thus: to separate it from dust and other impurities after it is threshed, they toss it with shovels from one end to the other of a long and large room; the lighter substances fall down in the middle of the room, and the corn only is carried from side to side, or end to end of it. After this they screen the corn, and then, bringing it into the granaries, it is spread about half a foot thick, and turned from time to time about twice in a week; once a week they also repeat the screening it. This sort of management they continue about two months, and after that they lay it a foot thick for two months more, and in this time they turn it once a week, or twice, if the season be damp, and now and then screen it again. After about five or six months, they raise it to five or six feet thickness in the heaps, and then they turn it once or twice in a month, and screen it now and then. When it has lain two years, or more, they turn it once in two months, and screen it once a quarter, and, how long soever it is kept, the oftener the turning and screening is repeated, the better the grain will be found to keep.

It is proper to leave an area of a yard wide on every side the heap of corn, and other empty spaces, into which they turn and toss the corn, as often as they find occasion. In Kent they make two square holes at each end of the floor, and one round in the middle, by means of which they throw the corn out of the upper into the lower rooms, and so up again, to turn and air it the better. Their screens are made with two partitions, to separate the dust from the corn which falls into a bag; and when sufficiently full, this is thrown away, the pure and good corn remaining behind.

Corn has, by these means, been kept in our granaries thirty years; and it is observed, that the longer it is kept, the more flour it yields in proportion to the corn, and the purer and whiter the bread is, the superfluous humidity only evaporating in the keeping. At Zurich, in Swisserland, they keep corn eighty years or longer, by the same sorts of methods.

The public granaries at Dantzick are seven, eight, or nine stories high, having a funnel in the midst of every floor, to let down the corn from one to another. They are built so securely, that though every way surrounded with water, the corn contracts no damp, and the vessels have the convenience of coming up to the walls for their lading. The Russians preserve their corn in subterranean granaries, of the figure of a sugar-loaf, wide below, and narrow at top: the sides are well plaistered, and the top covered with stones. They are very careful to have the corn well dried before it is laid into these store-houses, and often dry it by means of ovens, the summer dry weather being too short to effect it sufficiently.

GRANGE, a house or farm furnished with granaries and barns for holding corn, stables for horses, stalls for cattle, &c.

GRANIFEROUS *Pods*, are such as contain small seeds resembling grain.

GRANIVOROUS, an epithet given to animals that feed on corn or seed.

GRAPE, the fruit of the vine. *See the article* VINE.

The best and most general sorts of grapes, either for the garden, for wine, or for verjuice, are 1, the morillons; 2, the chasselas; 3, the muscats; 4, the corinths; 5, the malmsies;

malmſies; 6, the bourguignons; 7, the bourdelais; 8, the ſans-moireau, or grapes without ſtones; 9, the melier; 10, the gamet; and 11, the gouais.

1. The morillons are of ſeveral ſorts, almoſt all of which are well known in moſt places, and of which ſome are very good, both for the table and for making wine.

The early morillon, which we call the July grape, has ſmall, round, black berries, growing looſe on the bunches. It ripens in England about the beginning of Auguſt, has a ſugary juice, with but little flavour, and is very apt to be eaten by birds and flies. It may be allowed a corner in the garden, well expoſed to the ſouth, and ſheltered from the wind; but its only merit is its ripening early.

The morillon taconné, or black cluſter, likewiſe called the meunier, or miller, from the hoary down of its leaves, ripens ſomewhat later than the former, yields plentifully, and makes good wine. The bunches of this are ſhort, the berries oval, and ſo cloſe together, that many of thoſe on the inſide continue green, when the outer ones are perfectly ripe. It delights in a ſandy light ſoil, ripens here in September, and is by ſome called the Burgundy grape; but this name belongs more properly to the common black morillon, which the people of Burgundy diſtinguiſh by the appellation of pineau, and which thoſe of Orleans term the auvernat, becauſe it came originally from Avergne. Its berries are oval, and hang looſer on the bunches than thoſe of the black cluſter grape; by which means they are ripened more equally. This ſort is very ſweet, ſugary, black, good to eat, grows well in almoſt any ſoil, and yields an excellent wine. Its leaf is rounder than that of any other ſort of grapes, and its wood, when cut, is redder. The beſt ſort is that whoſe joints are not above three fingers breadth aſunder. Another ſpecies of this morillon, to which the French give the name of pineau aigret, or tartiſh taſted pineau, has longer, thicker, more pithy, and leſs compact, wood than the former; its joints are at leaſt the breadth of four fingers aſunder; the outſide of its bark is very red, and its leaf is divided into three parts, like that of the fig-tree. The berries of this are ſmaller, and hang in looſer cluſters, than thoſe of the foregoing ſort; nor does it yield much fruit: but the wine that is made of this fruit is ſtrong, and even better than that of the preceding ſpecies. A third ſort of morillon, which the French diſtinguiſhed by the appellation of franc morillon, lampereau, and beaune, bloſſoms earlier than the others, and yields equally good wine. The wood of this is black, as is alſo its fruit, which promiſes greatly whilſt green, but above half of it is generally loſt before it attains to a proper maturity. This vine runs into wood more than either of the former ſorts, and its joints are farther diſtant from each other.

There is alſo a white morillon, which is excellent to eat, but its ſkin is harder than that of the common black morillon; and there is likewiſe, of this ſpecies, the Orleans gray auvernat.

2. The chaſſelas, otherwiſe called muſcadet, or white bar-ſur-aube, is a large, white, and excellent grape, either for eating, for keeping long, for drying, or for making good wine. Its berries do not grow cloſe together; and it is peculiarly fit for ſtony vineyards, becauſe it ripens there the moſt eaſily. There is another ſort of white bar-ſur-aube, a ſpecies of the large corinth, which will be ſpoken of hereafter.

The black chaſſelas, known in Provence and Languedoc by the name of the Greek grape, is ſcarcer than the white: and ſo is alſo the red, the berries of which are likewiſe bigger. Both of theſe are excellent.

3. Almoſt all the muſcat grapes are exquiſite.

The white muſcat, or Frontignan, has long, thick, and very cloſely cluſtered bunches. It is excellent for eating, for preſerving, for making wine, or for drying in an oven, or by the heat of the ſun. As the berries of theſe grapes are very ſmall, and grow extremely cloſe together, they ſhould, eſpecially where it can be done with moſt eaſe, be carefully thinned early in the ſeaſon, that the ſun and air may not be hindered from entering them, and that they may not be rotted by the moiſture which would otherwiſe be detained.

The early white Piémont muſcat, which deſerves ſingular eſteem, has longer bunches, leſs cloſely cluſtered, and more unctuous.

The red or coral muſcat, ſo called from the livelineſs of it colour, has the ſame qualities, its berry is yet firmer, and requires a pretty deal of ſun to ripen it well.

The black muſcat is larger, and grows extremely cloſe. It has not ſo high a flavour; but it is very ſugary, and is much eſteemed, becauſe it is a great bearer, and its fruit ripens pretty early.

The purple muſcat is of a leſs deep colour, and bears very large bunches, which are well garniſhed with large high flavoured berries. This, and the red, yield the moſt vinous juices of all the ſorts of muſcats.

The malmſy muſcat will be ſpoken of under the head of malmſy grapes.

The ribeezatte muſcat has a pretty ſtrong flavour of muſk: its berry is ſmaller than that of the other ſorts, and its juice is ſo ſweet and agreeable, that it would be accounted one of the firſt of grapes, if it was leſs apt to ſhed its bloſſoms, and alſo, if it was leſs apt to degenerate.

The long muſcat, or paſſe-muſqué of Italy, has very long and big bunches of large oval berries, hanging ſomewhat looſe. This is ſcarce, and does not ripen without a great deal of heat: though, if it be but half ripe, it is the beſt of all grapes to preſerve for a ſweetmeat; the fire exalting that fine flavour in it, which the ſun had not time, or power to perfect.

The long purple muſcat, which ſome call the Madeira grape, is rare; but uncommonly beautiful and good.

There is likewiſe the Jeſus muſcat, the berries of which are very large and round. This has a very high perfumed flavour, and is extremely ſcarce.

The gennetin, otherwiſe called the Orleans muſcat, belongs alſo to this ſpecies of grapes. It is very ſugary, apt to ſhed its bloſſoms, and reſembles the melié, or rather the malmſy; for which reaſon ſome call it likewiſe the white malmſy. The dealers in wine at Paris often ſell the gennetin wine for the true muſcat of Frontignan.

4. The black corinth, or, as it is vulgarly called, the currant grape, is ſugary and delicious. Its berries are round, very ſmall, and cloſely cluſtered on the bunch, which, for its thickneſs, is rather long, and they have not any ſtone.

The purple corinth is a little bigger than the black, like which it is an excellent fruit, and has no ſtone; but it is very apt to ſhed its bloſſoms; for which reaſon it ſhould be pruned longer than other vines.

The grape without ſtones is a ſort of white barſur aube, but its berries are ſmaller, and ſomewhat tarter. It is very fit for drying, becauſe it has not any ſtones; for which reaſon it is often called the large corinth, or currant.

It is to be obſerved, that all the muſcats and corinths, being apt to ſhed their bloſſoms, ſhould be pruned long, or grafted upon the bourdelais, when it is not deſired they ſhould have a ſtrong muſky flavour.

5. The malmſy grape is of a greyiſh colour, and the vines which produce it are great bearers. Its berries are ſmall, but very ſugary, high flavoured, early ripe, and ſo full of juice, that, like the Orleans gray auvernat, it is reckoned one of the moſt melting grapes. The red malmſy is of a flame colour, and has the ſame qualities as the ſort before mentioned. The white malmſy is ſcarcer, and ripens leſs early. The gray malmſy is the moſt uſed, and generally thought to be the beſt of the three.

There is likewiſe the muſked malmſy, otherwiſe muſcat de malvoiſie. It comes from Mont-ferrat: the country round about Turin is full of it; and its flavour of muſk is higher than that of any other grape.

6. The bourguignon, or treſſeau, is a pretty large black grape, better to make wine of than to eat. The vines of this ſpecies bear moſt plentifully, and their branches are of a good ſize.

The white bourgignon, called in ſome places mourlon, and in others the clozier, has joints at the diſtance of two fingers and an half broad from each other, its fruit grows on a ſhort ſtalk, its branches are cloſely cluſtered, its leaf is very round, like that of the guoais, and it endures froſty weather.

The noirat, or black grape, otherwiſe called the dyer, or Spaniſh plant, is another ſort of black bourguignon.

Its

Its wood, like that of the former, is hard and very black; the pith of this wood is ſmall and compact; its joints are ſhort; its leaf has a red ſtalk, is of the middle ſize, and quite round. It reſiſts the froſt better than any other vine; but its juice is very flat, and ſerves only to give a deep colour to the wine it is mixed with; for which reaſon a few, and but a few, of theſe vines are planted in each vineyard that is to produce red wine. It is alſo good for wounds. The dyers give a great price for the wine that is made of this grape, to dye their cloths with.

7. The bourdelais is of three ſorts, viz. white, red, and black. Its bunches, and their berries, are very large. It is uſed chiefly to make verjuice, and for ſweet-meats. It is likewiſe an excellent ſtock for grafting all ſorts of grapes, eſpecially thoſe that are apt to ſhed their bloſſoms, ſuch as the Damaſcus, the corinths, and particularly the purple kind of this laſt ſpecies. The muſcats may alſo be engrafted on it, and ſo, in ſhort, may all other vines.

The apricot grape, the Greek vine, and the farineau, are three ſpecies of the bourdelais.

The apricot grape is ſo called, becauſe its fruit is of a golden yellow, like the apricot: its bunches are beautiful, and very large.

The Greek vine, likewiſe called the marvellous grape, and the St. James of Galicia, becauſe that part of Spain is full of it, is red, bears large, round, and ſweet berries, which ripen early, and make good wine. It produces very large, and beautiful bunches; and when the fruit is ripe, its leaves become ſtreaked and bordered with red, as is frequently the caſe of all vines whoſe fruit is variegated with black, purple, and red.

The farineau, or rognon-de-coq, as ſome call it, is white, has ſmall long berries, and is fitter to make verjuice than wine.

8. The ſans-moireau, which the people about Auxerre call quille-de-coq, is, a black grape, excellent for eating and for making wine. Its berries are ſomewhat long, firm, and cloſely cluſtered. There are three ſorts of this vine: the wood of the firſt and beſt is hard, and has ſhort joints; the ſecond is very like the firſt; and the third, called the ſans-moireau chiqueté, or white prunelas, becauſe it has whiter wood than the others. It yields but a flat wine, bears only in ſome years, and its berries are apt to drop off entirely before they are fit to be gathered.

The red prunelas, or negrier, has a red rind, long jointed wood, thick pith, a jagged leaf, and bears large bunches of tranſparent and very red grapes. It is one of the lateſt ripeners, and yields a laſting, but rough wine; for which reaſon a few only of theſe plants are ſet in vineyards of black grapes; but juſt enough to deepen the colour of the wine, and to give it a body. It reſiſts froſt, becauſe its ſtem is tall and ſtrong.

9. The white melié is one of the beſt of grapes for making wine, and for eating. It yields greatly, and has a good juice, which keeps pretty well. It is an excellent fruit for drying.

The black melié is neither ſo well taſted, nor ſo vinous as the white.

The green melié, which ſome call only the green plant, is the moſt eſteemed of this ſpecies of grapes, becauſe it yields greatly, does not ſhed its bloſſoms, and the wine made of it never turns yellow.

The ſurin is a ſpecies of the melié. Its berries are ſomewhat oblong, and a little pointed. The fruit of this vine has an excellent flavour, and is greatly liked in Auvergne.

10. The gamet is a very common grape, yields plentifully, and grows more eaſily than any other: but it affords only a very weak wine, which has but little flavour; nor does this ſort of vine laſt many years. There is a white gamet, and a black gamet.

11. The gouais is likewiſe very common. One ſort of it is white, and another purple, with a bloom, like that on plums. Its vine will laſt an hundred years in the ground. It bears larger and longer bunches than the gamet; but, like it, has too poor a juice to make good wine. It is even inferior to the gamet in this reſpect: but it makes excellent verjuice, and fine ſweet-meats. Very few, if any, of this ſpecies, ſhould be left in a vineyard.

12. Beſides theſe eleven moſt general ſorts of grapes, there are many others, which though leſs uſually ſpoken of, ought to be known.

The beaunier, ſo called becauſe it is very common and much eſteemed at Beaune, is a grape which yields greatly, and has ſome reſemblance to the white gouas. At Auxerre, it is called the ſervinien.

The fromenteau is an exquiſite grape, and well known in Champagne. It is of a gray red, grows in pretty large bunches, which are very cloſely cluſtered, has a tough ſkin, an excellent juice, and makes the beſt of wine. It is to this grape that the famous wine of Sillery owes its merit and renown.

The ſauvignon is a black grape, pretty big and long, very high flavoured, and exceedingly good. There is alſo a white ſauvignon, which has the ſame qualities as the black: but both of them are ſcarce, and not much known.

The pinquant-paul is a very ſweet white grape. It is likewiſe called the bec-d'oiſeau, or bird's bill, and in Italy, pizutelli, pointed, becauſe its berry, which is large and very long, is pointed at each end.

There is alſo the purple pizutelli, otherwiſe called dent-de-loup, or wolf's tooth, which has likewiſe a long berry, but leſs pointed. It is one of the plumpeſt and moſt beautiful of grapes, and yields a pretty good juice, which will keep for a long time.

The grape which the French call the gland, becauſe it is ſhaped like an acorn, is of a deep yellow colour, very ſweet, and keeps well.

The blanquette de limons, is a white grape, tranſparent as glaſs. Its bunch is long and pretty big: it yields greatly, and its juice is very ſweet and delicious.

The white robe, and the black robe, yield alſo plentifully. Their bunches are thick and long, their berries ſmall, and very cloſe together; but, being a ſpecies of the ſmall Bourdelais, they do not ripen eaſily.

The Alicant vine, commonly called the great black Spaniſh, bears bunches of very large berries, which are good to eat, and ſtill better to make the wine ſo vaunted in Spain; uſually called tent, in this country.

The berries of the African grape are as big as plums, and the bunches of them are proportionably large. Theſe berries are rather long than round, and ſomewhat flat towards the point. The wood of this vine is very thick, and its leaf very large. The aſſiſtance of a wall, and a great deal of ſun, are neceſſary to ripen this fruit thoroughly.

The morocco, or barbarou, is a large purple grape, the bunches of which are alſo of an extraordinary ſize. The berries are big, round, and hard, the wood reddiſh, and the leaf ſtreaked with red. Some vines of this ſpecies yield amazingly, and bloſſom three times a year.

The Damaſcus grape is likewiſe excellent to eat; its bunches are very big and long, its berry very large, long, and of an amber colour. It has but one ſtone, and is very apt to ſhed its bloſſoms; for which reaſon it ſhould be pruned long. There is a white ſort, and a red ſort, of this grape.

The Italian grape, otherwiſe called pergoleze, is of two ſorts, viz. the white and the purple. Its bunches are large, and the berries long and looſe ſet; but they require a conſiderable degree of heat to ripen them.

The Mantuan vine yields a very early fruit; for it ripens in the beginning of Auguſt. Its bunch is pretty large, and it does not ſhed its bloſſoms: the berries too are pretty big, rather long than round: they are of a fine rich amber colour, and contain a very vinous juice.

The Auſtrian vine, or cioutat, has a leaf divided like that of parſley: its fruit is white, ſweet, yields well, and reſembles the chaſſelas; but its juice is not vinous.

The Swiſs grape is rather curious than good. Its bunches are thick and long, and their berries are variegated with black and white, ſometimes in ſuch manner that one half of a berry is of one of theſe colours, and the other half of the other.

A ſhort recapitulation of the above-mentioned different ſorts of grapes, will at once ſhew what each of them is fitteſt to be planted for.

GRAPES *proper for the Garden.*

The cioutat; the black and the white chaſſelas; the white, the black, the red, the long, and the muſky muſcat.

cat, with the early Orleans muſcat, commonly called the gennetin; the corinth, ſmall or large, red or purple; the malmſy, gray or red; the Italian, the African, the Damaſcus, the Morocco, the apricot, the white robe, the melié, eſpecially the white; and the Bourdelais.

GRAPES *proper for the Vineyard.*

The pineau, or Auvernat, the gray Auvernat; the white morillon, and the morillon taconné; the gennetin; the pinquant-paul, the beaumier, the treſſeau, and all the bourquignons; the Bourdelais, the Swiſs, the Spaniſh black, or Alicant; the ploqué, the ſans-moireau, or grape without ſtones, the negrier, the fromenteau, the blanquette de limons, and moſt of the garden grapes, eſpecially the melié, the white robe, the black and the red muſcat, and the chaſſelas. A few plants of the gouais may alſo be intermixed with them.

GRAPES *proper for making Verjuice.*

The farineau, the white and the purple gouais, and the white and the black gamet.

GRASS, a general name for moſt of the herbaceous plants uſed in feeding cattle.

The beſt ſeaſon for ſowing graſs-ſeed is the latter end of Auguſt, and the beginning of September, that the graſs may be well rooted before the froſt ſet in, which is apt to turn the plants out of the ground, when they are not well rooted. This ſeed ſhould be ſown in moiſt weather, or when there is a proſpect of ſhowers, which will ſoon bring the graſs up; for, the earth being at that ſeaſon warm, the moiſture will cauſe the ſeed to vegetate in a few days: but, where this cannot be performed in autumn, the ſeeds may be ſown in the ſpring; towards the middle of March will be a good time, if the ſeaſon proves favourable.

The land on which graſs-ſeed is intended to be ſown, ſhould be well ploughed, and cleared from the roots of noxious weeds, ſuch as couch-graſs, fern, ruſhes, heath, gorſe, broom, reſt-harrow, &c. which, if left in the ground, will ſoon get the better of the graſs, and over-run the land. Therefore, in ſuch places where either of theſe weeds abound, it will be a good method to plough up the ſurface in April, and let it lie ſome time to dry; then lay it in ſmall heaps, and burn it. The aſhes ſo produced, when ſpread on the land, will be a good manure for it. The method of burning the land is particularly uſeful; eſpecially, if it is a cold ſtiff ſoil; but where couch-graſs, fern, or reſt-harrow, is in plenty, whoſe roots run far under ground, the land muſt be ploughed two or three times pretty deep in dry weather, and the roots carefully harrowed off each ploughing; which is the moſt ſure method to deſtroy them. Where the land is very low, and of a ſtiff clayey nature, which holds water in winter, it will be of ſingular ſervice to make ſome under-ground drains to carry off the wet; which if detained too long on the ground, will render the graſs ſour. The method of making theſe drains is preſcribed under the article DRAINING.

Before the ſeed is ſown, the ſurface of the ground ſhould be made level and fine, otherwiſe the ſeed will be buried unequal. The quantity of graſs-ſeed for an acre of land is uſually three buſhels, if the ſeed is clean, otherwiſe there muſt be a much greater quantity allowed; when the ſeed is ſown, it muſt be gently harrowed in, and the ground rolled with a wooden roller; which will make the ſurface even, and prevent the ſeeds being blown in patches. When the graſs comes up, if there ſhould be any bare ſpots, where the ſeed has not grown, they may be ſown again, and the ground rolled, which will fix the ſeeds; and the firſt kindly ſhowers will bring up the graſs, and make it very thick.

Some people mix clover and rye-graſs together, allowing ten pounds of clover, and one buſhel of rye-graſs, to an acre: but this is only to be done where the land is deſigned to remain but three or four years in paſture, becauſe neither of theſe kinds are of long duration; ſo that, where the land is deſigned to be laid down for many years, it will be proper to ſow with the graſs-ſeed ſome white trefoil, or Dutch clover; which is an abiding plant, and ſpreads cloſe on the ſurface of the ground, ſending forth roots at every joint; and makes the cloſeſt ſward of any, and is the ſweeteſt feed for cattle: ſo that, whenever land is laid down to paſture, there ſhould always be ſix or eight pounds of this ſeed ſown upon each acre.

The following ſpring, if there ſhould be any thiſtles, ragwort, or ſuch other troubleſome weeds, come up among the graſs, they ſhould carefully be cut up with a ſpaddle before they grow large; and this ſhould be repeated two or three times in the ſummer, which will effectually deſtroy them; for, if theſe plants are ſuffered to ripen their ſeeds, they will be blown all over the ground; their ſeeds having down adhering to them, which aſſiſts their tranſportation; ſo that they are often carried by the wind to a great diſtance, and thereby become very troubleſome weeds to the graſs. For want of this care, how many paſtures may be ſeen almoſt over-run with theſe weeds, eſpecially the ragwort; when a ſmall expence, if applied in time, would have intirely extirpated them! for a man may go over ſeveral acres of land in one day with a ſpaddle, and cut up the weeds juſt below the ſurface of the ground, turning their roots upwards; which if done in dry weather, they will ſoon decay; but this muſt always be performed before the plants come to have their ſeeds formed; becauſe after that many ſorts will live long enough to nouriſh their ſeeds after they are cut, ſo as to ripen them: and there will be a ſupply of weeds for ſome years after, which cannot be extirpated without a much greater expence.

The proper management of paſture land is the leaſt underſtood of any part of agriculture: the farmers never have attended to this, being more inclined to the plough; though the profit attending that has not of late years been ſo great as to encourage them in that part of huſbandry: but theſe people never think of laying down land for paſture, to continue longer than three years; at the end of which time they plough it up again, to ſow it with grain.

Their uſual method is to ſow rye-graſs and trefoil with barley, when they intend to lay down the ground; or ſometimes ſow only clover with the barley; nor is it poſſible to convince theſe people of their error in ſowing corn with this graſs; which they affirm to be uſeful in ſhading the graſs; not conſidering how much the corn draws away the nouriſhment from the graſs: but it is in vain to write to theſe people, who are not to be convinced, either by argument or experiment; ſo much are they led by cuſtom, as not to be led or driven out of their own methods; but, as their practice of huſbandry has greatly leſſened the circumſtances of the farmers, ſo that the lands are daily falling into the hands of the owners, therefore this part of huſbandry ſhould by them be principally attended to, as it may be carried on with much leſs expence: for paſture land requires but few hands to manage; whereas the ſowing of corn is attended with great expence, and the profit is very precarious: but, when this is attended with ſucceſs, and the grain at a moderate price, if the whole labour is to be paid for, there will be little coming to the owner for rent, when the balance is fairly ſtated; but in this moſt gentlemen deceive themſelves, and often ſuppoſe they gain by farming, when, perhaps, the whole rent of the land is loſt: therefore, to avoid the trouble which attends this ſort of huſbandry, it will be the beſt method to turn as much of their land into paſture, as they can; which, by grazing and feeding of ſheep, will be attended with little expence, and a ſure profit.

It is not uncommon for the huſbandman, for want of diſtinguiſhing graſſes for ſeed, to fill his ground with either weeds or bad and imperfect graſſes. Whereas by making a proper choice, he would always have the beſt graſs, and in the greateſt abundance his land will admit of.

In the common way of proceeding, if a farmer wants to lay down his land to graſs, he either takes his ſeeds indiſcriminately from his own foul hay-rick, or ſends to his neighbour for a ſupply. By this means, beſides a certain mixture of rubbiſh, which muſt neceſſarily happen; it is not unlikely, but that what he intends for dry land may have come from moiſt, where it grew naturally, and ſo on the contrary: and the conſequence of this ſlovenly method frequently is, that the ground, inſtead of being covered in one year with a good ſward, is filled with weeds not natural to it, which would never have ſprung up, if they had not been brought thither.

"Argu-

"Arguments, says Mr. Stillingfleet, are never wanting in support of ancient customs, and I am no stranger to those, such as they are, which prejudice and indolence have made use of on this occasion.

"1. Some say then, that if you manure your ground properly, good grasses will come of themselves. I own they will. But the question is, how long it will be before that happens: and why be at the expence of sowing what you must afterwards try to kill? which must be the case, as long as people sow all kinds of rubbish under the name of hay-seeds. Again, if the best way is to let the ground take its chance, why is the farmer at the expence of procuring the seeds of the white and broad clover, which come up in almost all parts of England spontaneously? But if this is allowed not to be the best way in relation to clover of any kind, what reason can be in nature, why grass-seeds only ought not to be sown pure?

"2. Others say, that it is better to have a mixture of different seeds. I will suppose this to be true. But cannot a mixture be had though the seeds be gathered, and separated? and is not a mixture by choice more likely to be proper, than one by chance? especially after a sufficient experience has been had of the particular virtues of each sort, of the different kinds of cattle which each grass is most adapted to, of the different grounds where they will thrive best, &c. all which circumstances are now, in general, wholly unknown, though of the utmost consequence.

"3. It is said by some, that weeds will come up along with the grass. No doubt of it. Can any one imagine that grass-seeds should be exempted from what happens to every other kind of seeds? But I will venture to say, that not near the quantity of weeds will spring up which they imagine, if the grass be sown very thick. Men must be very much put to it, when they make such objections as this last, or indeed any of the others. I am almost inclined to say with a great writer, It is a simple thing to take much pains to answer simple objections.

"One would hardly think it possible, that the slovenly method of proceeding, here complained of, could prevail universally: yet this is the case as to all grasses, except the darnel (or rye) grass, and what is known in some few countries by the name of the Suffolk grass; and this latter instance is owing, I believe, more to the soil than to any care of the husbandman. Now, would the farmer be at the pains of separating, once in his life, half a pint, or a pint, of the different kinds of grass seeds, and take care to sow them separately, in a very little time he would have wherewithal to stock his farm properly, according to the nature of each soil, and might at the same time spread these seeds properly over the nation, by supplying the seed shops.

"I have had frequent experience how easy it is to gather the seeds of grasses, having several times employed children of ten or eleven years old, who have gathered many sorts for me without making any mistakes, after I had once shewn them the sorts I wanted.

"I have procured thus the creeping bent, the fine bent, the sheep's fescue, the crested dog-tail, &c. in sufficient quantities to begin a stock; but, for want of a proper opportunity of cultivating them myself, or meeting with any one who had zeal enough to bestow a proper care on them, my collections of this kind hitherto have only proved, that the scheme is in itself feasible.

"In the year 1761, a little boy gathered, by my directions, as much of the crested dog-tail, in three hours, by the side of a road, as, when shed, yielded, upon weighing, above a quarter of a pound averdupois, perfectly free from husks. As this seed is small, the skilful will easily judge how far such a quantity would go if properly employed.

"My very estimable and ingenious friend Mr. Aldworth, who was witness of the fact which I last mentioned, at my desire, ordered a small part of a meadow, near his seat at Stanlake, which had better grasses, and less mixed, than the rest, to be left unmowed till the seeds were fit for gathering. This piece yielded, upon threshing and sifting, a full bushel by measure, of almost pure seed of the crested dog-tail.

"In case any one should be inclined to follow this example, I think it highly necessary to observe, that care must be taken to mow the grass before it sheds; that it be mowed very early in the morning, before the dew is off the ground, and that it ought not to be spread as in making hay, but left as it falls from the scythe during a sufficient time, and then be gently turned over.

"The number of grasses fit for the farmer is, I believe, very small; perhaps half a dozen, or half a score, are all he need to cultivate; and how small the trouble would be of collecting the seeds of these, and how great the benefit, must be obvious to every one at first sight. Would not any one be looked upon as wild, who should sow wheat, barley, oats, rye, peas, beans, vetches, buck-wheat, turneps, and weeds of all sorts together? Yet how is it much less absurd to do what is equivalent in relation to grasses? does it not import the farmer to have good hay and grass in plenty? and will cattle thrive equally on all sorts of food? We know the contrary. Horses will scarcely eat hay that will do well enough for oxen and cows. Sheep are particularly fond of one sort of grass, and fatten upon it faster than any other in Sweden, if we believe Linnæus. And may they not do the same in England? How shall we know till we have tried? Nor can we say, that what is valuable in Sweden, may be inferior to many other grasses in England, since it appears by the Flora Suecica, that they have all the good ones that we have. But however this may be, I should rather choose to make experiments than conjectures."

The Society for promoting Agriculture, &c. in the province of Britany, has laid down the most rational plan yet formed by any body of men, nobly associated for the welfare of their country, and which promises the greatest advantages to mankind. A part of this plan is the cultivating separately most of the plants which grow naturally in the fields there, in order to know which of them will afford the most and the best food for cattle.

As the husbandman would not be benefited by knowing the particular classes, genera, &c. under which Ray, Linnæus, and other botanists have ranged the several species of grasses, we shall here give the names of such of them as may be cultivated to most advantage in this country, with the best drawings (for which we are indebted to Mr. Stillingfleet) of some of the most profitable sorts, which it will be of service to the farmer to be able to distinguish rightly.

The common dogs grass, quich grass, or couch grass (*Gramen spicâ triticeâ repens vulgare, caninum dictum*) common creeping grass, with a spike like wheat, called dogs grass, will thrive in almost any soil, and can scarcely be got out again after it has once taken possession: so greatly does it multiply by its roots and trailing branches, which put forth roots and shoots at every joint. It grows to the height of four or five feet, with blades so rough and coarse, that few horses will eat them, especially while they are green: but it yields abundant crops of hay, which does well enough for oxen, and therefore deserves, perhaps, more attention than our farmers have yet bestowed upon it. M. Duhamel indicates the best way of making the most of it, when he directs the farmer always to mow it before its seeds ripen, or its stalks grow hard; for after that cattle refuse it; adding, that it soon shoots up again, and will bear frequent cutting.

This plant is well known to all husbandmen, to whom it is a sad plague, when it gets into their arable land. It is the chiendent of the French, who, I must observe here for the benefit of their husbandry, do not distinguish it sufficiently from our

Rye grass, which is C. Bauhin's *Gramen loliaceum angustiore folio, et spica*, Darnel grass, with a narrower leaf and spike; and Linnæus's *Lolium spicâ muticâ*, Darnel with a chaffy spike: for darnel grass, rye grass, and ray grass, are only different names of one and the same plant: though M. Duhamel, mislead by the erroneous spelling of some writers, who have called rye grass ray grass, has been mistakenly induced to think, that these are two different plants with us. We distinguish, indeed, two considerably different species of the rye grass, viz. the foregoing, which, according to Mr. Ray, is the *Lolium rubrum*, or red darnel; and the *Lolium album*, which, according to the same author, is C. Bauhin's *Gramen loliaceum spicâ longiore*, darnel grass, with a longer spike, and the

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yvraie of the French, by us commonly called darnel only. But both of them are equally rye grafs. It is the laft of thefe fpecies, viz. the *lolium album*, which is chiefly cultivated in England, efpecially in ftrong cold land, upon which it will fucceed better than any other fpecies, and is an earlier feed in the fpring: but it is very coarfe; and unlefs it be cut quite early for hay, it becomes fo hard and wirey in the ftalks, that few cattle care to eat it: for this fort of grafs has but few leaves, and runs all to ftalks. When cattle have been turned in to feed upon it, the remaining ftalks or bents, as they are fometimes called, fhould be mowed off in June; for otherwife they will dry upon the ground, give the pafture the difagreeable appearance of a ftubble field during all the latter part of fummer, and be fo very troublefome to the cattle which feed on it, by tickling their noftrils, that nothing but the want of better grazing will compel them to eat of the young grafs which fhoots up between thefe withered ftems; for they will not eat them. Thofe who think that they do, when ftreightened for food, are greatly miftaken, according to Mr. Miller, who fays, that he has clofely attended to this many years, and has always found thefe bents remaining on the ground untouched, till the frofts, rain, and winds, have deftroyed them in the winter. Befides this, by permitting them to ftand, the after growth of the grafs is greatly retarded, and the beautiful verdure of the fields is loft for three or four months. It therefore is good hufbandry to mow them clofe to the ground, before they become too dry: and if this cutting is then made into hay, it will ferve to feed cart horfes in the winter, fo as to repay the expence of mowing.

The red darnel is a confiderably inferior fpecies of rye grafs; for it has yet narrower leaves, and its ftalks grow hard much fooner. It is very common in moft pafture grounds, becaufe it flowers early, and its feeds ripen and fow themfelves before the hay is cut. They, therefore, who would keep their paftures as clear as poffible from this grafs, fhould always mow them before its feeds are ripe.

Rye grafs is ufually fown with clover, upon fuch lands as are defigned to be plowed again in a few years; and a common method is to fow it with fpring corn. But Mr. Miller, from many repeated trials, has always found, that when this grafs has been fown in Auguft, and a few fhowers have fallen fhortly after, the crop has been by much the beft: for it then has often been fo high as to afford a good feed the fame autumn; and a ton and a half of hay has been mowed early the next fpring off each acre of land, though it has been a cold and four foil. "I am, therefore, fays he, convinced of that being the beft feafon for fowing thefe graffes; though it will be very difficult to perfuade thefe perfons to alter their practice, who have been long wedded to old cuftoms. The quantity of feeds which I allow to an acre is about two bufhels, and eight pounds of the common clover, which, together, will make as good a covering upon the ground as can be defired. But this is not to be practifed upon lands where the beauty of the verdure is principally regarded. It is fitteft for thofe who have only profit in view." However, we muft reckon as an abatement of this profit, that, as M. Duhamel rightly obferves, the ground that has been under rye grafs, which is not fo profitable a crop as either lucerne, fainfoin, or even clover, is not able to bear wheat the next year, as it is after thofe other plants, or after a crop of roots."

According to Mr. Lifle's information, the farmers in the Ifle of Wight prefer rye grafs to hop clover, becaufe, fay they, the rye grafs will bear the winter, and keep to a good head, which the clover will not do. One of his tenants there had an acre and a half of rye grafs upon tolerably good ground, which he fhut up from Michaelmas till within a month of Candlemas, and from thence to the middle of April it kept fifteen ewes and fifteen lambs.

Rye grafs feldom lafts more than three years, as it is commonly managed: but Mr. Lifle is ftrongly of opinion, that, confidering the nature of its roots, and its manner of propagating itfelf, by fending forth fibres from its joints, it may be kept alive many years longer, by dunging it, or by refrefhing it with foil, when it begins to decay, after the fecond or third year: befides which, this will make its roots tiller, and mat on the ground, to the utter fuppreffion and deftruction of all weeds, not excepting even the couch grafs.

An acquaintance of his near Upcern, in Dorfetfhire, told him, that he had as much rye grafs feed on eighteen acres of land, as was worth twenty pounds; and that, after the feed was threfhed out, that hay was better than oat-ftraw fodder. Mr. Lifle himfelf faw a rick of this coarfe ftubbed hay, and a rick of oat ftraw, both of which had been laid open to the cattle, in the fame place; and they would not touch the ftraw, but had made fuch a hole in the rye grafs hay rick, that it was ready to fall. The fame perfon affured Mr. Lifle, that he found the rye grafs to be excellent food for his cattle, if it was mowed green, and not kept for the lucre of the feed. His ufual allowance was three bufhels of this feed to an acre of land, and he ufed to fell it for twenty-two pence, or two fhillings a bufhel.

Another farmer fhewed Mr. Lifle fome of his rye grafs, faying, that he looked upon it as his choiceft fodder for fheep. He mowed it when in the flower; and Mr. Lifle declares, that he thought it very fine hay. Others again, and thofe men of experience, have affirmed, that the very ftubble of the rye grafs, mowed the fame year it was fowed, is, when ploughed in, as good as dunging, and will pay for the feed.

Mr. Lifle agrees with all other experienced hufbandmen, that, though rye grafs will maintain as many cattle on an acre as hop clover will do; yet it does not, like it, improve the land for a fubfequent crop of corn; the reafon of which he takes to be, that the roots of the rye grafs, confifting of a multitude of matty fibres, which run on the furface of the ground, gird and hold the earth fo ftrongly together, that they cannot eafily be difintangled from it by ploughing.

"If I may judge of this grafs, fays Mr. Stillingfleet, by the venifon I have eaten out of a paddock that was chiefly filled with this fpecies, I would by no means recommend it for parks. I know it will be faid, that venifon is never good out of paddock, that the deer muft have room to range, trees to browfe on, &c. I grant there is fome reafon for faying this, but I believe in general it is more owing to the want of proper food, viz. good grafs, than merely to confinement; for paddocks are generally made out of a rich fpot of ground near the houfe, that has conftantly been manured, and of courfe is full of grafs fitter for the dairy or the ftable, than for deer; which hardly ever is the cafe in large parks. No man, will, I fuppofe, pretend to make good pork from a hog fed with grains inftead of peas, tho' he has the liberty of choofing as much ground as he pleafes, and where he pleafes."

In a fubfequent editition of his Obfervations on Graffes, he adds, "I have fince eaten venifon out of a large park, where there was much of this grafs, and it was no better than that out of the paddock. I fhould be apt to think from hence, that this grafs would not be proper for fheep, as I have always obferved that the fame kind of ground which yields good venifon, yields alfo good mutton. For what particular ufes it is good, wants to be tried; whether for the dairy, for fattening cattle, or for horfes. Many are tempted, by the facility of procuring the feed of this grafs, to lay down with it grounds near their houfes, where they want to have a fine turf: but unlefs the foil be very rich, a worfe grafs cannot be chofen for this purpofe, as it will certainly die off entirely in a very few years."

The wall barley, or way bennet, as fome people improperly term it, is evidently from the fhape of its ear, and from every other characterifing circumftance, a rye grafs, or wild rye, as Mr. Ray obferves, though very different from the preceding. It is the *gramen fecalinum et fecale fylveftre*, called tall meadow rye grafs by Mr. Miller, who reckons it an excellent grafs for fowing, becaufe it is very leafy, its ftalks do not become ftiff and hard like many other fpecies, and its roots are perennial. He feems not to doubt, but that it may be rendered very fine by proper care; and as its roots are perennial, rolling will make them mat, fo as to form a very clofe fward. There are three forts of it, viz. the greater, the leffer, and the marfh rye grafs. Mr. Stillingfleet wifhes, that this genus only were to be called rye grafs, and that the old name of darnel

nel were continued to the *gramen loliaceum*, or rye grafs, before fpoken of.

The two beft fpecies of grafs for paftures are, in Mr. Miller's opinion, C. Bauhin's *gramen pratenfe, paniculatum majus, anguftiore folio*, meadow grafs, with large panicles, and a narrower leaf, which is the *poa paniculâ diffufâ, fpiculis, quadrifloribus pubefcentibus culmo erecto tereti*, Flor. Suec. 77. Poa with a diffufed panicle, the fmaller fpikes having four hairy flowers, and a taper erect ftraw; and C. Bauhin's *gramen pratenfe, paniculatum majus, latiore folio*, meadow grafs, with a larger panicle, and broader leaf, which is the *poa paniculâ diffufâ, fpiculis trifloribus glabris, culmo erecto tereti*, Flor. Suec. 76. Poa with a diffufed panicle, fmall fpikes with three flowers, and an upright ftraw.

Thefe feem to be the great meadow graffes Mr. Stillingfleet obferves are common in our beft meadow grounds. He has alfo met with them frequently on banks by the road fide, and near ditches, even where they were not to be found in the adjoining meadows and paftures. But as he has not favoured us with a botanical defcription of them, we can only form conjectures.

If the feeds of thefe two forts were carefully collected and fown feparately, without any mixture of the feed of other grafs, they would not only afford a greater quantity of fodder on the fame fpace of land, but the grafs would alfo be better, the hay fweeter, and the verdure more lafting, than that of any other fpecies. Mr. Miller recommends this particularly to every gentleman who would improve the verdure near his habitation.

The annual meadow grafs makes the fineft of turfs. It grows every where by way fides, and on rich found commons. It is called in fome parts the Suffolk grafs, as we mentioned before. Mr. Stillingfleet fays, he has feen whole fields of it in High Suffolk, without any mixture of other graffes, and as fome of the beft falt butter we have in London comes from that country, it is moft likely to be the beft grafs for the dairy. *See* ANNUAL MEADOW GRASS.

As the next beft to meadow grafs, Mr. Miller recommends Ray's *gramen avenaceum pratenfe elatius, paniculâ flavefcente, locuftis parvis*, taller meadow oat-grafs, with a yellowifh panicle, and fmall hufks, which is the *avena paniculâ laxâ, calycibus trifloris brevibus, flofculis omnibus ariftatis*, Prod. Leyd. 66. Oat-grafs with a loofe panicle, three flowers in each empalement, which is fhort, and all the flowers having awns. Mr. Ray likewife recommends the fmooth mountain oat-grafs, which he calls *gramen avenaceum montanum fpicâ fimplici, ariftis recurvis*, found by Mr. Dale, upon Bartlow hills in Effex, on the edge of Cambridgefhire, in the borders of the corn fields between Newmarket and Exning, and on the chalk hills between Northfleet and Gravefend: and the rough or hairy oat-grafs, which he diftinguifhes by the appellation of *gramen avenaceum hirfutum, paniculâ purpuro-argentiâ fplendente*, and which abounds in the paftures about the earl of Cardigan's houfe at Twittenham, in Middlefex. He alfo includes under this genus, all the feftuca kinds, of which Mr. Stillingfleet gives the following account, in his Obfervation on Graffes, fubjoined to his tranflations of feveral ingenious tracts, felected from the Tranfactions of the Academy of Upfal.

Sheeps fefcue, which he diftinguifhes by the name of *feftuca ovina*, is the grafs moft efteemed for the food of fheep in Sweden, where they have not fuch downs as we have.

Gmelin fays, that the Tartars choofe to fix, during the fummer, in thofe places where there is the greateft plenty of this grafs, becaufe it affords a moft wholfome nourifhment to all kinds of cattle, but chiefly fheep: and he obferves, that the fepulchral monuments of the ancient Tartars are moftly found in places which abound with this grafs, which fhows, adds he, that it has long been valued among them.

This grafs abounds in many parts of England and Wales, and particularly on all the fineft fheep paftures in Herefordfhire, Oxfordfhire, Norfolk, &c. Mr. Stillingfleet obferves, that it is a very early grafs, and that, contrary to what Linnæus fays, either fheep, or fome other animals do eat the flowering ftems of this grafs; for, when he fearched for it upon Banftead downs, he could fee no part of it but the radical leaves, except among bufhes near the hedges, where it was guarded from the fheep.

Mr. Stillingfleet fays, that he has always feen the purple fefcue along with the fine bent and filver hair grafs, which will be fpoken of hereafter, particularly on Banftead downs, in great plenty, in a place inclofed in order to keep the fheep out. From thence he is inclined to think, that this is the chief grafs all over the downs; but as the flowering ftems in the other parts were intirely gone at the time of his viewing it, except along the hedges, he could not be certain in this refpect.

After candidly declaring his want of knowledge of the qualities of the flote fefcue, which he calls *feftuca fluitans*, Mr. Stillingfleet quotes a curious paffage in the Tranfactions of the Academy of Upfal, where the author of a piece entitled *Plantæ Efculentæ* fays, that the feeds of this grafs are gathered yearly in Polland, and from thence carried into Germany, and fometimes into Sweden, and fold under the name of manna feeds, and that they are there much ufed at the tables of the great, on account of their nourifhing quality and agreeable tafte. Mr. Stillingfleet then adds, that one Mr. Dean, a very fenfible farmer at Rufcomb, in Berkfhire, affured him, "that a field of about four acres, which always lay under water, and was occupied by his father when he was a boy, was covered with a kind of grafs that maintained five farm horfes in good heart, from April to the end of harveft, without giving them any other kind of food, and that it yielded more than they could eat." Some of it was carried to Mr. Stillingfleet, who found it to be the flote fefcue, with a mixture of the marfh bent: but whether this laft contributes much towards furnifhing fo good pafture for horfes, feems doubtful to him. They both throw out roots at the joints of the ftalks, and are therefore likely to grow to a great length.

Linnæus fays, that the bran of this grafs will cure horfes troubled with bots, if they are kept from drinking for fome hours.

In the index of dubious plants, at the end of Ray's Synopfis, mention is made of a grafs called *gramen caninum fupinum longiffimum*, longeft fupine dog's grafs, which grows at Maddington in Wiltfhire, and in fome parts of Wales, to the length of twenty-four feet, and is ufed for the fattening of hogs. Its ftalks are of the creeping kind, and touch the ground at feveral of their knots; for they do not rife much in height. Mr. Stillingfleet thinks it the flote fefcue, and rightly advifes farther inquiries concerning it. But he does not feem here to have confulted Mr. Worlidge, who fays, fpeaking of this grafs, that it is extraordinarily fweet, but not fo eafily propagated as hath been imagined, the length thereof being occafioned by the wafhing of a declining fheep down, from whence hafty rains bring with them much of the fatnefs of the dung of the fheep, which fubfides upon the fmall meadows where this grafs grows: fo that in fprings not fubject to thefe fhowers, or on lands not enriched by that fertilifing foil brought down to them, this grafs does not thrive fo well.

The vernal grafs, which Mr. Stillingfleet calls *anthoxanthum odoratum*, and which is at leaft a fpecies of Ray's *gramen vernum fpicâ brevi laxâ*, and of C. Bauhin's *gramen vernum pratenfe fpicâ flavefcente*, vernal grafs, with a loofe yellowifh fpike, is one of the earlieft graffes, and grows very commonly in all our meadows, paftures, and other grounds. It is found in plenty upon thofe paftures which fheep are fond of, and from whence excellent mutton comes; and therefore it is moft likely to be a good grafs for fheep paftures. Mr. Stillingfleet fays, he has found it on all kinds of grounds, from the moft fandy and dry to the moft ftiff and moift, and even in bogs. It is very plentiful in the beft meadows about London, viz. towards Hampftead, and Hendon; and its feeds may be gathered very eafily, as it fheds them upon the leaft rubbing. This grafs gives a grateful odour to hay.

Mr. Lifle remarks, that the *gramen parvum repens purpureâ fpicâ*, fmall creeping grafs, with a purple fpike, is no indication of bad ground, though it be a very bad grafs. Ray fays, that it is very common in paftures. There feems to be a great fweetnefs in it. The fame may be faid of the *gramen criftatum*, or fmooth crefted grafs, which alfo abounds every where in our meadows and paftures.

The meadow fox-tail grafs *(gramen alopecuroides)* abounds in our beft meadows about London, and makes very good hay; perhaps the beft of any that is brought to market here. Mr. Stillingfleet obferved in the fpring of the year 1762, a meadow near Hampftead, which confifted of this grafs chiefly, with fome of the vernal grafs and the corn-brome grafs: but it is fcarce in many parts of England, particularly in Herefordfhire, Berkfhire, and Norfolk; though it might be gathered at almoft any time of the year, even from hay-ricks, as it does not fhed its feeds without rubbing, which is the cafe of but few graffes.

The water fox-tail *(alopecuroides paludofum)* is alfo found in fuch meadows about London as are found and lie under water in the winter. Mr. Stillingfleet thinks it may, perhaps, be a proper grafs to fow on fuch grounds.

Mr. Stillingfleet has always found the fine bent-grafs, which he names *agroftis capillaris*, in great plenty on the beft fheep paftures, as on Malvern-hills, Bagfhot-heath, and all the high grounds in Herefordfhire, Berkfhire, Oxfordfhire, and Norfolk, and other places remarkable for good mutton.

The fame may be faid of the mountain hair-grafs, which he calls *aira flexuofa*; and of the filver hair-grafs, which is his *aira caryophillea*.

The quaking-grafs, cow-quake, or lady's-hair, as it is called in fome places, is the *gramen tremulum maximum*, of C. Bauhin, and J. Ray, and the *briza fpiculis cordatis, flofculis feptendecim*, Hort. Cliff. 23. Briza with heart-fhaped little fpikes, and feventeen flowers in each. Though a very poor and flender grafs, Mr. Lifle thinks it no indication of poor land where it grows: for, as Mr. Ray obferves, it is the moft common grafs of any in all the pafture grounds throughout England.

Mr. Miller defcribes it as having an annual root, which fends up many broad hairy leaves, between which arife flender ftiff ftalks, from a foot to near two feet high, dividing upward into a large loofe panicle, garnifhed with heart-fhaped fmall fpikes, each having about feventeen fmall flofcules, or florets; and thefe, after the flowers are paft, are fucceeded by a fingle feed. The heads hang by flender long foot-ftalks, which are moved by every wind, fo that they generally appear fhaking; from whence it had the name of quaking-grafs. There is a fmaller fpecies of it, which is a native of England; but, I believe, of no greater value than the former. Thefe graffes come to head in May: and this gave rife to the Englifh proverb, May, come fhe early come fhe late, makes the cow quake.

Matweed *(gramen fparteum)* is of the broom kind, and delights in fandy places, near the fea. Even clouds of fand blown over it do not hurt, but, on the contrary, promote its growth. It has been of excellent fervice in fixing loofe fands, as, if I have been rightly informed, it once did very remarkably in Norfolk. Of ten fpecies of this plant, which Mr. Ray diftinguifhes, the following are the chief. 1. *Spartum Plinii, five juncus Hifpanicus*, the true matweed of Pliny, or Spanifh broom; 2. *Gramen fparteum paniculâ brevi folliculo inclusâ*, hooded matweed; 3. *Gramen fparteum marinum Anglicanum*, Englifh fea matweed, or marram; 4. *Spartum maximum maritimum Hollandicum, fpicâ fecalinâ*, the greateft Holland matweed, with a rye fpike; 5. *Gramen fparteum pennatum*, Feather-grafs; and 6. the *Gramen fparteum juncifolium*, or *fpartum parvum*, fmall matweed.

Mr. Stillingfleet fays, that the beft mutton he ever tafted, next to that which comes from hills, where the purple and fheep's fefcue, the fine bent, and the filver hair graffes abound, was fed upon the crefted dog-tail grafs, which he and Mr. Hudfon call *cynofurus criftatus*. He therefore rightly judges it proper for parks; and confirms this opinion, by adding, that he knows a park where this grafs abounds, which is famous for excellent venifon. It makes a very fine turf upon dry, fandy, or chalky foils: but unlefs it be fwept over with the fcythe, its flowering ftems will look brown; as is the cafe of all graffes which are not fed by a variety of animals: for that fome animals will eat the flowering ftems, is evident from commons, where one fcarcely fees any part of the graffes, except the radical leaves.

Mr. Miller thinks the cock's-foot grafs (Ray's *Gramen dactylon*, Hift. p. 1271) the capon's-tail grafs (Ray's *Gramen murorum fpicâ longiffimâ*, Hift. p. 1286) and the millet graffes *(Gramina miliacea)* too coarfe to deferve attention in England; though fome of their fpecies are very ufeful in the warm parts of America, where there is a great fcarcity of finer grafs, and even much better adapted for fuch climates, than any of our European graffes; becaufe many of them lie flat on the ground, and emit roots from their joints, by which means they are well prepared for heat; of which their large and juicy ftalks likewife enable them to bear an extraordinary degree.

The purple, or, as it is commonly called, red meadow trefoil, which is C. Bauhin's *Trifolium pratenfi purpureum*, has already been fufficiently diftinguifhed from the common red clover, or red honeyfuckle (Ray's *Trifolium purpureum majus, pratenfi fimile, Syn.* 328) which though Mr. Lifle thinks otherwife, is undoubtedly a native of England, as is manifeft from its fpontaneous and flourifhing growth on the top of many mountains, particularly in even the moft northern parts of Scotland, where no mortal furely ever dreamt of cultivating it. The fpecies called yellow meadow trefoil, or hop-clover, is C. Bauhin's *Trifolium pratenfe luteum, capitulo lupuli, vel agrarium*; and the fmaller kind of this, commonly called nonefuch, or black feed, is the *Trifolium luteum, lupulinum, minimum*. M. Duhamel rightly prefers the firft of thefe forts for artificial paftures, and obferves, that it is the only fpecies now cultivated in France, for that purpofe.

Our meadows afford us the white meadow trefoil, honeyfuckle-grafs, or white Dutch clover, which is the *trifolium pratenfe album* of C. Bauhin, and by far the beft fort of clover for lafting paftures, becaufe it is the fweeteft and moft abiding of all the plants of this kind.

This white clover, befides being perennial, fends forth roots and fhoots from every joint of its trailing branches, for it does not rife high, and thereby forms the clofeft fward of any of the artificial graffes. It is exceeding fweet food for all forts of cattle: for which reafon a quantity of the feeds of this plant fhould always be fown with the other grafs-feeds, on whatever land is intended to be laid down for pafture. The ufual allowance of this feed is eight pounds to an acre. But it never fhould be fown with corn; becaufe this will weaken it, fo that it will be fcarcely worth ftanding. And yet, as Mr. Miller obferves, fuch is the covetoufnefs of moft farmers, that they will not be prevailed on to alter their old cuftom of laying down their ground with a crop of corn; though they lofe twice the value of that corn, by the poornefs of the grafs, which will not then come to a good fward: and one whole feafon is alfo loft: for if this feed is fown in the fpring, without corn, there will be a crop of hay to mow by the middle, or latter end of July, and a much better after-feed for cattle the following autumn and winter, than the grafs which is fown with corn will produce the fecond year. It may alfo be fown with grafs-feed in autumn, in the manner before directed for the common red clover; and if the feeds grow kindly, this autumnal fowing will afford a good early crop of hay the following fpring. If the ground is well rolled after this crop is taken off, the clover will mat clofe upon it, and form a thick fward.

Confiderable quantities of the feeds of this white clover are imported hither annually from Flanders, by the way of Holland; from whence it has received the name of Dutch clover: not that it is more a native of that country, than of this; for it is very common in the paftures all over England; but the feeds of it were never collected here, for fowing, till of late years; nor are there yet many perfons in this kingdom who fave them, though they may be faved with the fame eafe, and in the fame manner, as is practifed for the red clover. Every farmer who would improve his land, fhould therefore fow an acre or two with this white clover, unmixed, merely for the fake of its feeds, which are often fold at a great price. He will by this means fave the expence of buying them; and he will eafily find purchafers for any quantity he may have to fpare.

I do not know that the narrow leaved plantain, or ribwort *(Plantago anguftifolia)* hath ever been cultivated purpofely

purpofely for the food of cattle. It grows, indeed, in almoft all paftures: but, as it will thrive upon dry very fpots, becaufe it ftrikes a deep root, it may probably deferve farther trial.

The late Dr. Eliot, recommends two forts of graffes, natives of North America, of which he lately fent over a parcel of the feeds to the London Society for the Encouragement of Arts, &c. by whom they have been diftributed here, fo that we may hope foon to know their fuccefs in this country, and of which he has given an account in his Effays upon Field-Hufbandry in New England. *See the articles* BIRD-GRASS, *and* TIMOTHY-GRASS.

GRASS-*Walks*. As to grafs-plats and green walks, they are made, for the moft part, not by fowing grafs-feed, but by laying turfs: and indeed the turfs from a fine common or down, are much preferable to fown grafs: but if walks or plats are to be made by fowing, the beft way is to procure the feed from thofe paftures where the grafs is naturally fine and clear, or elfe the trouble of keeping it from fpiry or benty grafs will be very great, and it will fcarce ever look handfome.

In order to fow grafs-walks, the ground muft be firft dug; and when it has been firft dreffed and laid even, it muft be very carefully raked over, and all the clods and ftones taken off, and then covered over an inch thick with good mould. This being done, the feed is to be fown pretty thick, that it may come up clofe and fhort; it muft then be raked over again, to cover the feed, that if the weather fhould happen to be windy, it may not be blown away. It ought alfo to be obferved, that where grafs is fown in gardens, either for lawns or walks, there fhould always be a good quantity of the white trefoil or Dutch clover fown with it; for this will make a fine turf much fooner than any other fown grafs, and will continue a better verdure than any other of the grafs-tribe.

In order to keep grafs-plats or walks handfome, and in good order, you may fow in autumn frefh feed over any places that are not well filled, or where the grafs is dead; but nothing improves grafs fo much, as mowing and conftant rolling.

When turf is laid in gardens, it is a general practice to cover the furface of the ground, under the turf, either with fand or very poor earth; the defign of this is, to keep the grafs fine, by preventing its growing too rank. This is proper enough for very rich ground, but it is not fo for land that is poor; for when this is practifed in fuch places, the grafs will foon wear out, and decay in patches.

GRASS-*Leafe*, grafs-lands, or lands appropriated to grafs, for feeding of cattle.

GRATTEN, a term ufed in Cornwal, to imply the mowing of grafs, the firft year after the land has been manured with fea-fand; and this operation they call mowing in gratten.

GRAVEL, a congeries of fmall pebbles, which, being mixed with a ftiff loam, makes lafting and elegant walks in our gardens.

Opinions, with regard to the choice of gravel, are various; fome are for having it as white as poffible, and in order to render it the more fo, caufe the walks to be often rolled with ftone-rollers, which add a whitenefs to the furface. But this renders them very troublefome to the eyes, by reflecting too ftrongly the rays of light: fuch gravel, therefore, as will lie fmooth, and reflect the leaft, fhould be preferred. Again, fome fcreen the gravel too fine, but this is an error; for if it be caft into a round heap, and the great ftones only are raked off, it will be the better. There are many kinds of gravel which do not bind, and by this means caufe a continual trouble of rolling, to little or no purpofe; as for fuch, if the gravel be loofe or fandy, you fhould take one load of ftrong loam, and two of gravel, and fo caft them well together.

The beft and moft efteemed gravel is that of Blackheath, in Kent, which being mixed with a proper proportion of loam (found alfo on the fame common) makes the moft beautiful and lafting walks any where; nor is it confined to a few places about London, for we have known feveral tons of it exported to adorn the pope's garden at Rome, although it may be fuppofed fo much beneath his holinefs's dignity to tread upon it; but Italy cannot produce a more handfome *terra firma*.

The month of March is the propereft time for laying gravel; for it is not prudent to do it fooner, or to lay walks in any of the winter months before that time. In making thefe walks, great regard muft be had to the level of the ground, fo as to lay the walks with eafy defcents towards the low parts of the ground, that the wet may be eafily drained off: but when the ground is level, it will be proper to have fink-ftones laid by the fides of the walk, and at convenient diftance, to let off the wet; and when the ground is naturally dry, the drains from the fink-ftones may be contrived fo as to convey the water into feffpools, from which the water will foak away in a fhort time; but in wet lands there fhould be under-ground drains, to convey the water off, either into ponds, ditches, or the neareft place proper to receive it.

Some are apt to lay gravel walks too round, but this is an error; becaufe they are not fo good to walk upon; and befides, it makes them look narrow; one inch is enough in a crown of five feet; and it will be fufficient, if a walk be ten feet wide, that it lies two inches higher in the middle than it does on each fide; if fifteen feet, three inches; if twenty feet, four inches; and fo in proportion.

For the depth of gravel-walks, fix or eight inches may do well enough; and a foot in thicknefs will be fufficient for any; but then there fhould always be a depth of rubbifh laid under the gravel, efpecially if the ground be wet.

Some turn up gravel-walks into ridges, in December, in order to kill the weeds; but this is very wrong, fince it never anfwers the end; and, therefore, if conftantly rolling them after rain and froft, will not effectually kill the weeds and mofs, you fhould turn the walks in March, and lay them down at the fame time.

In order to deftroy worms that fpoil the beauty of gravel or grafs-walks, fome recommend the watering them with water made very bitter, by fteeping walnut-tree leaves in it; but if, in the firft laying of the walks, there be a good bed of lime-rubbifh laid at the bottom, it will prove the moft effectual method to keep out the worms, for they never harbour near lime.

GRAVELLY-*Land*, that which abounds with gravel and fand. *See the article* SANDY-LAND.

The beft manure for this fort of land is marl, or any ftiff clay that will diffolve with the froft, cow-dung, chalk, mud, and half rotten ftraw from the dunghill.

GREASE, a difeafe incident to horfes and other cattle, confifting of fwellings and gourdinefs of the legs.

In order to treat this diforder with fome propriety, without having recourfe to the falling down of humours for its explanation, we fhall confider it as arifing from two different caufes; a fault or relaxation in the veffels, or a bad difpofition of the blood and juices. In order to this, it will be neceffary to obferve, that the blood and juices are carried to the extreme parts by the arteries, and returned by the veins; confequently the blood muft rife perpendicularly in the latter, in order to return from the extremities to the heart. And hence fwellings in the legs of horfes may be eafily accounted for, as a partial ftagnation of the blood and juices may be naturally expected where the circulation is languid, efpecially when there is a want of due exercife, and a proper mufcular compreffion on the veffels to pufh forward the returning blood, and propel the inert, and half ftagnating fluids through their veffels. In fhort, the blood, in fuch cafes, cannot fo eafily afcend and defcend, or a greater quantity will be brought by the arteries than can be returned by the veins.

The greafe then, confidered in this light, muft be treated as a local complaint, where the parts affected are alone concerned, the blood and juices being yet untainted, and in good condition; or as a diforder where they are both complicated: but when it is an attendant on fome other diftemper, as the farcy, yellow dropfy, &c. fuch difeafes muft firft be cured before the greafe can be removed. In the former cafe, moderate exercife, proper dreffing, cleanlinefs, and external application, will anfwer the purpofe; in the latter, internals muft be called in to our affiftance, with proper evacuations.

When a horfe's heels are firft obferved to fwell in the ftable, and fubfide, or go down, on exercife, let care be taken to wafh them very clean every time he comes in, with foap-fuds, chamberlye, or vinegar and water, which, with proper

proper rubbing, will frequently prevent or remove this complaint: or let them be well bathed twice a day with old verjuice, or the following mixture, which will brace up the relaxed veſſels; and if rags dipped in the ſame are rowled on, with a proper bandage, for a few days, it is moſt likely the ſwellings will ſoon be removed by this method only, as the bandage will ſupport the veſſels till they have recovered their tone. To anſwer this end alſo, a laced ſtocking, made of ſtrong canvaſs, or coarſe cloth, neatly fitted to the part, would be found extremely ſerviceable, and might eaſily be contrived by an ingenious mechanic.

> Take rectified ſpirit of wine four ounces, diſſolve it in half an ounce of camphor, to which add wine-vinegar, or old verjuice, ſix ounces; white vitriol, diſſolved in a gill of water, one ounce; mix together, and ſhake the phial when uſed.

But if cracks or ſcratches are obſerved, which ouſe and run, let the hair be clipped away, as well to prevent a lodgment (which becomes ſtinking and offenſive by its ſtay) as to give room for waſhing out dirt or gravel, which, if ſuffered to remain there, would greatly aggravate the diſorder.

When this is the caſe, or the heels are full of hard ſcabs, it is neceſſary to begin the cure with poultices, made either of boiled turneps and lard, with a handful of linſeed powdered, or oat-meal and rye-flour, with a little common turpentine, and hogs lard, boiled up with ſtrong beer grounds, or red wine lees. The digeſtive ointment being applied to the ſores for two or three days, with either of theſe pultices over it, will, by ſoftening them, promote a diſcharge, unload the veſſels, and take down the ſwelling, when they may be dried up with the following:

> Take white vitriol and burnt alum, of each two ounces; Ægyptiacum one ounce; lime water a quart, or three pints: waſh the ſores with a ſponge dipped in this, three times a day, and apply the common white ointment, ſpread on tow; to an ounce of which may be added two drams of ſugar of lead.

Or the following waſh and ointment may be uſed for that purpoſe.

> Take half an ounce of Roman vitriol, diſſolved in a pint of water; then decant off the clear into a quart bottle, add half a pint of camphorated ſpirits of wine, the ſame quantity of vinegar, and two ounces of Ægyptiacum.

> Take honey four ounces, white or red lead, powdered, two ounces, verdigreaſe in fine powder one ounce; mix together.

Some, for this purpoſe, apply allum-curd; others a ſtrong ſolution of allum in verjuice, with honey; and many of theſe forms may eaſily be contrived. But let it be remembered, that as ſoon as the ſwelling is abated, and the moiſture leſſened, it would be very proper to keep the legs and paſterns rolled up with a firm bandage, or linen rowler, two or three fingers wide, in order to brace up the relaxed veſſels, till they have recovered their natural tone.

This method is generally very ſucceſsful, when the diſtemper is only local, and requires no internal medicines: but if the horſe be full and groſs, his legs greatly gorged, ſo that the hair ſtares up, and is what ſome term pen-feathered, and has a large ſtinking diſcharge from deep foul ſores, you may expect to meet with great trouble, as theſe diſorders are very obſtinate to remove, being often occaſioned by a poor dropſical ſtate of blood, or a general bad diſpoſition in the blood and juices.

The cure in this caſe, if the horſe is full and fleſhy, muſt be begun by bleeding, rowels, and repeated purging; after which diuretic medicines are frequently given with ſucceſs. Thus,

> Take four ounces of yellow roſin, one of ſal prunellæ; grind them together with an oiled peſtel, add a dram of oil of amber, and give a quart of forge-water every morning, faſting two hours before and after taking, and ride moderately.

As this drink is found very diſagreeable to ſome horſes, I would recommend the nitre balls in its ſtead, given to the quantity of two ounces a day, for a month or ſix weeks, mixed up with honey, or in his feeds: take the following alſo for that purpoſe.

> Yellow roſin four ounces, ſalt of tartar, and ſal prunellæ, of each two ounces; Venice ſoap half a pound; oil of juniper half an ounce; make them into balls of two ounce weight, and give one every morning.

Or,

> Take nitre two ounces; camphor one dram, honey enough to make into a ball; give as the former.

The legs in this caſe ſhould be bathed or fomented, in order to breath out the ſtagnant juices, or to thin them, ſo that they may be able to circulate freely in the common current. For this purpoſe foment twice a day with a diſcutient fomentation, in which a handful or two of wood aſhes has been boiled; apply then the above poultice, or the following, till the ſwelling has ſubſided, when the ſores may be dreſſed with the green ointment till they are properly digeſted, and then dried up with the water and ointment above recommended.

> Take honey one pound, turpentine ſix ounces, incorporate with a ſpoon; and add of the meal of fenugreek and linſeed, each four ounces; boil in three quarts of red wine lees, to the conſiſtence of a poultice; to which add, when taken from the fire, two ounces of camphor in powder; ſpread it on thick cloths, and apply warm to the legs, ſecuring it on with a ſtrong rowler.

If the ſores are very foul, dreſs them with two parts of the wound ointment, and one of Ægyptiacum; and apply the following, ſpread on thick cloths, and rowled on.

> Take of black ſoap one pound, honey half a pound, burnt allum four ounces, verdigreaſe powdered, two ounces, wheat flour a ſufficient quantity.

If the diuretic balls ſhould not ſucceed, they muſt be changed for the antimonial and mercurial alteratives, already mentioned; but turning a horſe out in a field, where he has a hovel or ſhed to run to at pleaſure, would greatly contribute to quicken the cure; and, indeed, would in general effect it alone: but if this cannot be complied with, let him be turned out in the day time.

If the horſe is not turned out, a large and convenient ſtall is abſolutely neceſſary, with good dreſſing and care: this ſtall ſhould be ſix feet wide, that a tall horſe may ſhoot out his legs at length, ſo that the blood may circulate freely, without meeting with reſiſtance, which it naturally muſt, when a horſe lies all on a heap, or with his legs under him: nor ſhould the ſtable be paved with too great a declivity; for if the horſe ſtands too low with his hind legs, moſt of his weight will reſt upon them; and give him the greaſe, eſpecially if he be at all inclined to be gourdy.

The laſt thing we ſhall recommend, is to make him lie down in the ſtable as often as poſſible. This is undoubtedly of the utmoſt conſequence, as it will not a little contribute to the removal and cure of this diſorder; for by only changing the poſition of his legs, a freer circulation would be obtained, and the ſwelling taken down: whereas it is in general greatly aggravated by the obſtinacy of the horſe, which refuſes to lie down at all, probably from the pain it gives him in bending his legs neceſſary for that purpoſe; by which means the ſtiffneſs and ſwelling increaſes, till the over-gorged and diſtended veſſels are obliged to give way, and, by burſting, diſcharge the fluids that ſhould circulate through them. *Bartlet's Farriery, page* 284.

GREASE melted. *See the article* MOLTEN-GREASE.

GREEN-HOUSE, a conſervatory, or houſe erected in a garden, for preſerving ſuch tender and exotic plants as cannot bear the cold of our winters, if expoſed to the open air.

The following deſcription of a green-houſe is taken from Mr. Miller's Gardener's Dictionary, as the conſervatory

vatory given by that ingenious gardener is very well adapted to this climate.

The length of theſe houſes muſt be proportioned to the number of plants they are intended to contain; but their depth ſhould never be greater than their height in the clear, which, in ſmall or middling houſes, may be ſixteen or eighteen feet, and in large ones from twenty to twenty-four. The windows in front ſhould extend from about one foot and a half above the pavement, to within the ſame diſtance of the ceiling, which will admit of a corniche round the building, over the heads of the windows. In a ſmall green-houſe, the ſaſhes ſhould not be leſs than four or five feet broad; and in a large one, they ought not to exceed ſeven and a half; the ſhutters of which ought to fall back cloſe to the piers on the inſide, that, when open, they may not prevent any of the rays of light from reaching the plants. The piers between theſe windows, ſupporting the building, ſhould be as narrow as poſſible; for which reaſon they ſhould be either of ſtone or well-burnt brick. If they are of ſtone, they ought not to exceed two feet and a half in front, and ſhould be ſloped off backward to about eighteen inches broad, by which means the rays of the ſun will not be obſtructed by the corners of the piers, as they would be if they were ſquare: but if they are built of brick, it will be proper to make them near three feet in front, otherwiſe they will be too weak to ſupport the building: theſe I would alſo adviſe to be ſloped off in the manner directed for the ſtone.

At the back of the green-houſe, there may be erected an houſe for tools, and many other purpoſes; which will be extremely uſeful, and alſo prevent froſt from entering the houſe that way; ſo that the wall between theſe need not be more than two bricks and an half in thickneſs; whereas, were it quite expoſed behind, it ſhould be at leaſt three bricks in thickneſs; and by this contrivance, if you are willing to make an handſome building, and to have a noble room over the green-houſe, you may make the room over the tool-houſe, and carry up the ſtair-caſe in the back, ſo as not to be ſeen in the green-houſe; and hereby you may have a room twenty-five or thirty feet in width, and of a proportionable length: and under this ſtair-caſe, there ſhould be a private door into the green-houſe, at which the gardener may enter in hard froſty weather, when it will not be ſafe to open any of the glaſſes in the front. The floor of the green-houſe, which ſhould be laid either with marble ſtone, or broad tiles, according to the fancy of the owner, muſt be raiſed two feet above the ſurface of the ground whereon the houſe is placed, which, in dry ground, will be ſufficient: but if the ſituation be moiſt and ſpongy, and thereby ſubject to damps, it ſhould be raiſed at leaſt three feet above the ſurface: and if the whole is arched with low brick arches under the floor, it will be of great ſervice in preventing the damps riſing in winter, which are often very hurtful to the plants, eſpecially in great thaws, when the air is often too cold to be admitted into the houſe, to take off the damps. Under the floor, about two feet from the front, I would adviſe a flue of about ten inches in width, and two feet deep, to be carried the whole length of the houſe, which may be returned along the back part, and be carried up in proper funnels adjoining to the tool-houſe, by which the ſmoak may paſs off. The fire-place may be contrived at one end of the houſe, and the door at which the fuel is put in, as alſo the aſh-grate, may be contrived to open into the tool-houſe, ſo that it may be quite hid from the ſight, and be in the dry, and the fuel be laid in the ſame place, whereby it will always be ready for uſe.

I ſuppoſe many people will be ſurpriſed to ſee me direct the making flues under a green-houſe, which has been diſuſed ſo long, and by moſt people thought of ill conſequence, as indeed they have often proved, when under the direction of unſkilful managers, who have thought it neceſſary, whenever the weather was cold, to make fires therein. But however injurious flues have been under ſuch management, yet, when ſkilfully managed, they are of very great ſervice: for though perhaps it may happen that there will be no neceſſity to make any fires in them for two or three years together, as, when the winters prove mild, there will not; yet, in very hard winters, they will be extremely uſeful to keep out the froſt, which cannot be effected any other way, but with great trouble and difficulty.

Withinſide of the windows, in front of the green-houſe, you ſhould have good ſtrong ſhutters, which ſhould be made with hinges, to fold back, that they may fall back quite cloſe to the piers, that the rays of the ſun may not be obſtructed thereby. Theſe ſhutters need not to be above an inch and a half thick, or little more; which, if made to join cloſe, will be ſufficient to keep out our common froſt: and when the weather is ſo cold as to endanger the freezing in the houſe, it is but making a fire in your flue, which will effectually prevent it: and without this conveniency it will be very troubleſome, as I have often ſeen, where perſons have been obliged to nail mats before their windows, or to ſtuff the hollow ſpace between the ſhutters and the glaſs with ſtraw, which, when done, is commonly ſuffered to remain till the froſt goes away; which, if it ſhould continue very long, the keeping the green-houſe cloſely ſhut up, will prove very injurious to the plants: and as it frequently happens, that we have an hour or two of ſun-ſhine in the middle of the day, in continued froſts, which is of great ſervice to plants, when they can enjoy the rays thereof through the glaſſes; ſo when there is nothing more to do than to open the ſhutters, which may be performed in a very ſhort time, and as ſoon ſhut again when the ſun is clouded, the plants may have the benefit thereof whenever it appears; whereas, where there is ſo much trouble to uncover, and as much to cover again, it would take up the whole time in uncovering and ſhutting them up, and thereby the advantage of the ſun's influence be loſt. Beſides, where there is ſo much trouble required to keep out the froſt, it will be a great chance if it be not neglected by the gardener: for if he be not as fond of preſerving his plants, and as much in love with them as his maſter, this labour will be thought too great by him; and if he takes the pains to cover the glaſſes up with mats, &c. he will not care to take them away again, until the weather alters; ſo that the plants will be ſhut up cloſe during the whole continuance of the froſt.

There are ſome people who commonly make uſe of pots filled with charcoal to ſet in their green-houſe in very ſevere froſts; but this is very dangerous to the perſons who attend theſe fires; and I have often known they have been almoſt ſuffocated therewith; and at the ſame time they are very injurious to the plants: nor is the trouble of tending upon theſe ſmall; and the many hazards, to which the uſe of theſe fires is liable, have juſtly brought them into diſuſe with all ſkilful perſons; and as the contrivance of flues, and of the fires, are but ſmall charges, they are much to be preferred to any other method for warming the air of the houſe.

The back part of the houſe ſhould be either laid over with ſtucco, or plaiſtered with mortar, and white waſhed; for otherwiſe the air in ſevere froſt will penetrate through the walls, eſpecially when the froſt is attended with a ſtrong wind; which is often the caſe in the moſt ſevere winters. There are ſome perſons who are at the expence of wainſcoting their green-houſes; but, when this is done, it is proper to plaſter with lime and hair behind the wainſcot, to keep out the cold; and, when they are lined with wainſcot, they ſhould be painted white, as ſhould the ceiling, and every part within-ſide of the houſe: for this reflects the rays of light in much greater quantity than any other colour, and is of ſignal ſervice to plants, eſpecially in the winter, when the houſe is pretty much cloſed, and but a ſmall ſhare of light is admitted through the windows: for, at ſuch times, I have obſerved, that in ſome green-houſes which have been painted black, or of a dark colour, the plants have caſt moſt of their leaves.

Where green-houſes are built in ſuch places as will not admit of rooms over them, or the perſon is unwilling to be at the expence of ſuch building, there muſt be care taken to keep out the froſt from entering through the roof. To prevent which, it will be very proper to have a thickneſs of reeds, heath, or furze, laid between the ceiling and the tiles: in the doing of which, there muſt be care taken in framing the joiſts, ſo as to ſupport theſe, that their weight may not lie upon the ceiling, which might endanger it: for theſe ſhould be laid a foot thick at leaſt, and as ſmooth as poſſible, and faſtened down well with laths, to prevent their riſing; and then cover it over with a coat of lime and hair, which will keep out the air, and alſo prevent mice and other vermin, from harbouring in them; which, if left uncovered, they would certainly do. For want of this precaution, there are many green-houſes built, which will not keep out the froſt in hard winters; and this is many times attributed to the glaſſes in front admitting the cold, when the fault is in the roof: for where there is only the covering, either of tiles or ſlates, and the ceiling, every ſevere froſt will penetrate through them.

In this green-houſe you ſhould have treſſels, which may be moved out and into the houſe; upon which you ſhould fix rows of planks, ſo as to place the pots or tubs of plants in regular rows one above another, whereby the heads of the plants will be ſo ſituated as not to interfere with each other. The loweſt row of plants, which ſhould be the forwardeſt towards the windows, ſhould be placed about four feet therefrom, that there may be a convenient breadth left next the glaſſes to walk in front: and the rows of plants ſhould riſe gradually from the firſt, in ſuch a manner, that the heads of the ſecond rows ſhould be entirely advanced above the firſt, the ſtems only being hid thereby; and, at the backſide of the houſe, there ſhould be allowed a ſpace of at leaſt five feet, for the conveniency of watering the plants; as alſo to admit of a current of air round them, that the damps, occaſioned by the perſpiration of the plants, may be the better diſſipated, which, by being pent in too cloſely, often occaſions a mouldineſs upon the tender ſhoots and leaves; and when the houſe is cloſe ſhut up, this ſtagnating rancid vapour is often very deſtructive to the plants: for which reaſon alſo you ſhould never croud them too cloſe to each other, nor ſhould you ever place ſedums, euphorbiums, torch thiſtles, and other tender ſucculent plants, amongſt oranges, myrtles, and other ever-green-trees; for, by an experiment which I made anno 1729, I found that a ſedum, placed in a green-houſe among ſuch trees, almoſt daily increaſed its weight, although there was no water given to it the whole time; which increaſe of weight was owing to the moiſture imbibed from the air, which, being replete with the rancid vapours perſpired from the other plants, occaſioned the leaves to grow pale, and in a ſhort time they decayed, and dropped off; which I have often obſerved has been the caſe with many other ſucculent plants, when placed in thoſe houſes which were filled with many ſorts of ever-green-trees, that required to be frequently watered.

Therefore, to avoid the inconvenience which attends the placing of plants of very different natures in the ſame houſe, it will be very proper to have two wings added to the main green-houſe; which will greatly add to the beauty of the building, and alſo collect a greater ſhare of heat. The green-houſe ſhould be placed exactly fronting the ſouth; and one of the wings faces the ſouth-eaſt, and the other the ſouth-weſt; ſo that, from the time of the ſun's firſt appearance upon any part of the building, until it goes off at night, it is conſtantly reflected from one part to the other; and the cold winds are alſo kept off from the front of the main green-houſe hereby: and, in the area of this place, you may contrive to place many of the moſt tender exotic plants, which will bear to be expoſed in the ſummer ſeaſon: and in the ſpring, before the weather will permit you to ſet out the plants, the beds and borders of this area may be full of anemonies, ranunculus's, early tulips, &c. which will be paſt flowering, and the roots fit to take out of the ground, by the time you carry out the plants; which will render this place very agreeable during the ſpring ſeaſon that the flowers are blown; and here you may walk and divert yourſelf in a fine day, when, perhaps, the air in moſt other parts of the garden will be too cold for perſons not much uſed thereto, to take pleaſure in being out of the houſe.

In the center of this area may be contrived a ſmall baſon for water, which will be very convenient for watering of plants, and add much to the beauty of the place: beſides, the water, being thus ſituated, will be ſoftened by the heat, which will be reflected from the glaſſes upon it; whereby it will be rendered much better than raw, cold water, for theſe tender plants.

The two wings of the building ſhould be contrived ſo as to maintain plants of different degrees of hardneſs; which muſt be effected by the ſituation and the extent of the fire-place, and the manner of conducting the flues.

But I would here obſerve, that the wing facing the ſouth-eaſt ſhould always be preferred for the warmeſt ſtove; its ſituation being ſuch, as that the ſun, upon its firſt appearance in the morning, ſhines directly upon the glaſſes; which is of great ſervice in warming the air of the houſe, and adding life to the plants, after having been ſhut up during the long nights in the winter ſeaſon. Theſe wings, being ſixty feet in length, may be divided in the middle by partitions of glaſs, with glaſs doors to paſs from one to the other. To each of theſe there ſhould be a fire-place, with flues carried up againſt the back wall, through which the ſmoke ſhould be made to paſs, as many times the length of the houſe, as the height will admit of the number of flues; for the longer the ſmoke is in paſſing, the more heat will be given to the houſe, with a leſs quantity of fuel; which is an article worth conſideration, eſpecially where fuel is dear. By this contrivance, you may keep ſuch plants as require the ſame degree of heat in one part of the houſe, and theſe will thrive in a much leſs warmth in the other part.

The other wing of the houſe, facing the ſouth-weſt, may alſo be divided in the ſame manner, and flues carried through both parts, which may be uſed according to the ſeaſons, or the particular ſorts of plants which are placed therein; ſo that here will be four diviſions in the wings, each of which may be kept up to a different degree of warmth: which, together with the green-houſe, will be ſufficient to maintain plants from all the ſeveral countries of the world; and, without having theſe ſeveral degrees of warmth, it will be impoſſible to preſerve the various kinds of plants from the ſeveral parts of Africa and America, which are annually introduced into the Engliſh gardens; for when plants from very different countries are placed in the ſame houſe, ſome are deſtroyed for want of heat, while others are forced and ſpoiled by too much of it; and this is often the caſe in many places, where there are large collections of plants.

In the building theſe wings, if there are not ſheds running behind them their whole length, the walls ſhould not be leſs than two bricks thick; and if they are more, it will be better; becauſe, where the walls are thin, and expoſed to the open air, the cold will penetrate them; and when the fires are made, the heat will come out through the walls; ſo that it will require a larger quantity of fuel to maintain a proper temperature of warmth in the houſe. The back part of theſe houſes, having ſloping roofs, which are covered either with tiles or ſlates, ſhould alſo be lined with reeds, &c. under the covering, as is before directed for the green-houſe; which will keep out the cold air, and ſave a great expence of fuel; for the cloſer and better theſe houſes are built, and the glaſſes of the ſlope, as alſo in front, well guarded by ſhutters or reeds in a hard froſt, the leſs fuel will be required to warm the houſes; ſo that the firſt expence of building theſe houſes properly will be the cheapeſt, when the after expence of fires is taken into conſideration.

The ſloping glaſſes of theſe houſes ſhould be made to ſlide, and take off; ſo that they may be drawn down more or leſs, in warm weather, to admit air to the plants; and the upright glaſſes in front may be ſo contrived, as that every other may open as doors upon hinges; and the alternate glaſſes may be divided into two: the upper part of each ſhould be contrived ſo as to be drawn down like ſaſhes; ſo that either of theſe may be uſed to admit air, in a greater or leſs quantity, according as there may be occaſion.

But, beſides the conſervatories here mentioned, it will be proper to have a deep hot-bed frame, ſuch as is commonly uſed to raiſe large annuals in the ſpring: into which may be ſet pots of ſuch plants as come from Carolina, Virginia, &c. while the plants are too ſmall to plant in the open air; as alſo may other ſorts from Spain, &c. which require only to be ſcreened from the violence of of the frosts, and should have as much free air as possible in mild weather: which can be no better effected than in one of these frames, where the glasses may be taken off every day when the weather will permit, and put on every night; and in hard frosts, the glass may be covered with mats, straw, pease-haulm, or the like, so as to prevent the frost from entering the pots to freeze the roots of the plants, which is what will, many times, utterly destroy them; though a slight frost pinching the leaves or shoots very seldom does them much harm: if these are sunk a foot or more below the surface of the ground, they will be the better, provided the ground is dry; otherwise they must be wholly above ground: the sides of this frame should be built with brick, with a curb of wood laid round on the top of the wall, into which the gutters, on which the glasses slide, may be laid: the back wall of this frame may be four feet high, and the front one foot and an half; the width about six feet, and the length in proportion to the number of plants. *Miller's Gard. Dict.*

GREEN-SCOURING, a disease to which sheep and bullocks are often subject.

The best remedy for this disorder is verjuice; a wine glass full is enough for a sheep, and a pint for a bullock. *Lisle's Husbandry, vol. II. page* 211.

GRIP, or *Gripe*, a small ditch cut across a meadow or ploughed-field, in order to drain it. It is otherwise called a water-furrow.

GRIPES, a very acute disease to which horses are very often subject.

There seems to be no distemper so little understood by the common farrier, as the gripes or cholic in horses, one general remedy, or method, serving them in all cases; but as this disorder may be produced by very different causes, the method of cure must also vary, otherwise the intended remedy, injudiciously applied, will not only aggravate the complaint, but make it fatal. We shall divide this disorder into three different species: the flatulent or windy, the bilious or inflammatory, and the dry gripes; each of which we shall distinguish by their different symptoms, and then point out the proper remedies.

The flatulent, or windy cholic is thus known. The horse is often lying down, and as suddenly rising again with a spring; he strikes his belly with his hinder-feet, stamps with his fore-feet, and refuses his meat; when the gripes are violent, he will have convulsive twitches, his eyes be turned up, and his limbs stretched out as if dying, his ears and feet being alternately very hot and cold; he falls into profuse sweats, and then into cold damps; strives often to stale, and turns his head frequently to his flanks; he then falls down, rolls about, and often turns on his back; this last symptom proceeds from a stoppage of urine, that almost always attends this sort of cholic, which may be increased by a load of dung pressing on the neck of the bladder.

These are the general symptoms of cholic and gripes from wind, drinking cold water when hot, and when the perspirable matter is retained, or thrown on the bowels by catching cold; in all which cases they are violently distended. Cribbing horses are more particularly subject to this complaint, by reason they are constantly sucking in great quantities of air.

The first intention is to empty the strait gut with a small hand dipt in oil, which frequently makes way for the confined wind to discharge itself; and by easing the neck of the bladder, the suppression of urine is taken off, and the horse stales and gets ease.

Farriers generally strike a fleam into the bars of a horse's mouth, which seems to be of little or no use; for where a quantity of blood is intended to be taken away, the vessels of this part are neither large or numerous enough to furnish it; so that it is more eligible to take it from the neck-vein, and is always proper in full, sanguine, plethoric, young horses.

The following ball and clyster seldom fail of giving relief in these cases:

> Take Strasburgh or Venice turpentine, and juniper-berries pounded, of each half an ounce; salt-prunella, or salt-petre, an ounce; oil of juniper, one dram; salt of tartar, two drams: make into a ball, with any syrup; it may be given whole, and washed down with a decoction of juniper-berries, or a horn or two of ale.

If the horse does not break wind, or stale plentifully, he will find no relief; therefore in an hour or two give him another ball, and add to it a dram of salt of amber; which may be repeated a third time, if found necessary. During the fit the horse may be walked and trotted gently, but should by no means be harrassed beyond his ability, or dragged about till he is jaded.

The following clyster may be given, between the balls, or alone, and repeated occasionally:

> Take chamomile flowers two handfuls; anise, coriander, and fennel seeds, of each an ounce; long pepper half an ounce: boil in three quarts of water to two; and add Daffy's elixir, or gin, half a pint; oil of amber half an ounce, and oil of chamomile eight ounces.

The subsequent balls and drink are also very proper for this purpose, and to remove gripes occasioned by drinking cold water when hot, or catching cold after violent exercise:

> Take powder of anise, cumin, and fennel seeds, of each half an ounce; camphor two drams; pellitory of Spain, one dram; oil of juniper fifty drops, make into a ball with any syrup, and wash it down with a horn or two of ale.

Or,

> Take mithridate, or Venice treacle, two ounces; Matthew's pill two drams; camphor one dram, dissolved in a little spirit of wine; powder of fresh anniseed one ounce; or the same quantity of the cordial ball; dissolve in a pint and half of ale.

Or,

> Take philonium one ounce, or an ounce and an half; tincture of senna, or Daffy's elixir, and sallad oil, of each half a pint: give warm for a drink, and repeat it if necessary.

Either of these medicines are well calculated for this purpose; but as the ingredients may not always be ready at hand, or procureable, we shall put down a couple of drinks that have frequently, on trial, been found successful, and are easily prepared. It is to be observed, that the horse should be well rubbed, clothed, and littered with clean straw up to his belly.

> Take of Castile soap, or hard soap; nitre, or salt-petre, of each one ounce; juniper-berries and ginger, each half an ounce: Venice turpentine, or rosin, dissolved with the yolk of an egg, six drams: mix with a pint and a half of warm ale, or a decoction of juniper-berries, with a large onion boiled with them. This may be repeated twice or thrice.

Or,

> Take a pint of brandy, rum, or geneva, with as much sweet oil, and give for a drink. Should this not succeed, boil an ounce of pepper or ginger, in a quart of milk; and add to it a handful of salt, and half a point of oil: this given warm, will (according to Burdon) purge in two or three hours.

The signs of a horse's recovery, are his lying quiet, without starting, or tumbling, and his gathering up his legs, and ceasing to lash out; and if he continues an hour in this quiet posture, you may conclude all danger over.

The next species of cholic we shall describe, is the bilious or inflammatory, which, besides most of the preceding symptoms, is attended with a fever, great heat, panting, and dryness of the mouth; the horse also generally throws out a little loose dung, with a hot scalding water, which when it appears blackish, or of a reddish colour, and fetid smell, denotes an approaching mortification.

In this case the horse should immediately be bled to the quantity of three quarts; and it should be repeated, if the fymptoms do not abate in a few hours. The emollient clyfter, with two ounces of nitre diffolved in it, fhould be thrown up twice a day, to cool the inflamed bowels; plenty of gum arabic water fhould be taken; and a pint of the following drink given every two or three hours, till feveral loofe ftools are procured; and then it fhould be given only night and morning, till the diforder is removed.

> Take fenna three ounces, falt of tartar half an ounce; infufe in a quart of boiling water an hour or two; then ftrain off, and add two ounces of lenitive electuary, and four of glauber falts.

If this diforder is not removed by thefe means, but the inflammation and fever increafe, attended with a difcharge of the flefh-coloured water above defcribed, the event will moft probably be fatal; and the chief thing to be depended on now, muft be a ftrong decoction of Jefuits bark, given to the quantity of a pint every three hours, with a gill of red port wine.

A quart of the fame may be ufed for a clyfter, with two ounces of Venice turpentine, diffolved with the yolks of two eggs, an ounce of diafcordium, and a pint of red wine, and given twice a day: if the horfe recovers, give two or three mild rhubarb purges.

To a horfe of little value, give the following, which, in thefe cafes, has been found fuccefsful.

> Take diapente one ounce, diafcordium half an ounce, myrrh, in powder, two drams; make it into a ball with two drams of oil of amber, to be given twice or thrice a day.

The laft we fhall defcribe is the dry gripes, or the cholic, which arifes often from coftivenefs: it is difcovered by the horfe's frequent and fruitlefs motion to dung, the blacknefs and hardnefs of the dung, the frequent and quick motion of his tail, the high colour of his urine, and his great reftleffnefs and uneafinefs.

In this cafe the ftrait gut fhould be examined and emptied, with a fmall hand, oiled properly for that purpofe; the emollient oily clyfter, given under the article *clyfter*, fhould be thrown up twice a day; and the above purging drink given, till the bowels are unloaded, and the fymptoms removed.

The diet for a horfe in the gripes fhould be fcalded bran, warm water gruel, or white water, made by diffolving four ounces of gum arabic in a quart of water, and mixing it with this other water.

From this hiftory and divifion of gripes and cholics, with their different treatment, it appears how abfolutely neceffary it is they fhould be well underftood, in order to be managed fkilfully: it is plain, too, that violent hot medicines fhould, in every fpecies of this diforder, be guarded againft, and given with great caution and difcretion, even in the firft kind of flatulent cholic, where indeed they can only be wanted; yet too often, when prepared by the farriers, with oil of turpentine, geneva, pepper, and brine, &c. they even increafe that diforder, by ftimulating the neck of the bladder too forcibly, heating the blood, and inflaming the bowels, till a mortification is brought on them. Thefe are in general the conftant appearance of horfes that die of this diforder, whofe bowels, being examined for that purpofe, have been found inflamed, full of red and livid fpots, fometimes quite black, crifped with extream heat, and rotten.

GRIPS, the fwaiths, or fmall heaps of corn, lying in the field, as it is cut down with the fcythe or fickle.

GROATS, oats, after the fhells are taken off.

GROVE, a fmall wood impervious to the rays of the fun.

Groves are the greateft ornaments of a garden; nor can a garden be complete that has not one or more of thefe. In fmall gardens there is fcarce room to admit of groves of any extent; yet in thefe there fhould be at leaft one contrived, which fhould be as large as the ground will allow of; and where thefe are fmall, there is more fkill required in the difpofition, to give them the appearance of being larger than they really are.

Groves are of two forts, viz. open and clofe; open groves are fuch as have large fhady trees, which ftand at fuch diftances, as that their branches may approach fo near to each other, as to prevent the rays of the fun from penetrating through them: but as fuch trees are a long time in growing to a proper fize for affording a fhade, fo where new groves are planted, the trees muft be placed clofer together, in order to have fhade as foon as poffible; but in planting of thefe groves, it is much the beft way to difpofe all thefe trees irregularly, which will give them a greater magnificence, and alfo form a fhade fooner than when the trees are planted in lines; for when the fun fhines between the rows of trees, as it muft do fome part of the day in fummer, the walks between them will be expofed to the heat, at fuch times, until the branches of thefe trees meet; whereas, in the irregular plantations, the trees intervene, and obftruct the direct rays of the fun.

When a perfon, who is to lay out a garden, is fo happy as to meet with large full grown trees upon the fpot, they fhould remain inviolate, if poffible; for it will be better to put up with many inconveniencies, than to deftroy thefe, which will require an age to retrieve; fo that nothing but that of offending the habitation, by being fo near as to occafion great damps, fhould tempt the cutting them down.

Moft of the groves which have been planted in England, or thofe celebrated gardens in France, are only a few regular lines of trees; many of which join to the habitation, or lead to fome building, or other object: but thefe do not appear fo grand, as thofe which have been made in woods, where the trees have grown accidentally, and at irregular diftances, where the trees have large fpreading heads, and are left at fuch diftance as to permit the grafs to grow under them, then they afford the greateft pleafure; for nothing is more noble than fine fpreading trees with large ftems, growing through grafs, efpecially if the grafs is well kept, and has a good verdure; befide, moft of thefe planted groves have generally a gravel walk, made in a ftrait line between them; which greatly offends the fight of perfons who have a true tafte: therefore, whenever a gravel walk is abfolutely neceffary to be carried through thefe groves, it will be much better to twift it about, according as the trees naturally ftand, than to attempt regularity: but dry walks under large trees are not fo ufeful as in open places; becaufe the dropping of the trees will render thefe walks ufelefs, after rain, for a confiderable time.

Clofe groves have frequently large trees ftanding in them; but the ground is filled under thefe with fhrubs, or under-wood; fo that the walks which are made in them are private, and fcreened from the winds, whereby they are made agreeable for walking, at fuch times when the air is too violent or cold for walking in the more expofed part of the garden.

Thefe are often contrived fo as to bound the open groves, and frequently to hide the walls, or other inclofures of the garden: and when they are properly laid out, with dry walks winding through them, and on the fides of thefe fweet fmelling fhrubs and flowers irregularly planted, they have a charming effect; for here a perfon may walk in private, fheltered from the inclemency of cold or violent winds, and enjoy the greateft fweets of the vegetable kingdom: therefore, where it can be admitted, if they are continued round the whole enclofure of the garden, there will be a much greater extent of walk: and thefe fhrubs will appear the beft boundary where there are not fine profpects to be gained.

Thefe clofe groves are by the French termed bofquets, from the Italian word bofquetto, which fignifies a little wood; and in moft of the French gardens there are many of them planted; but thefe are reduced to regular figures, as ovals, triangles, fquares, and ftars: but thefe have neither the beauty or ufe which thofe have that are made irregularly, and whofe walks are not fhut on each fide by hedges, which prevents the eye from feeing the quarters; and thefe want the fragrancy of the fhrubs and flowers, which are the great delight of thefe private walks; add to this the keeping of the hedges in good order, is attended with a great expence; which is a capital thing to be confidered in the making of gardens. *Miller's Gard. Dict.*

GROUND, a general name for land, be the foil what it will.

The Romans were very attentive to examine the nature of the ground before they broke it up, and diftinguifhed guished it into three situations, champaign, hilly, and mountainous. They rightly approved most of a champaign country, declining gradually from the foot of a hill toward the south, or south-east; if a hill rising gently; and if a mountain neither lofty, nor rugged, but covered with plenty of wood and grass. Either of these situations is eligible, according to the purpose for which the ground is intended; some plants affecting hotter, others colder exposures; some delighting to dwell on hills, others in vallies; and some again being indifferent to either: but, generally speaking, most vegetables choose the warm and kindly soil of low grounds, fertilised by what the rains bring down to them from the hills and more elevated parts.

The spontaneous produce of the earth is an infallible indication of the nature and quality of the ground. Wild thyme shews it to be good for feeding cattle; betony and strawberries direct to wood; camomile points out a mellow soil fit for wheat; burnet indicates land fit for pasture; and mallows denote it proper for the uses of the kitchen-garden, as has been observed by lord Bacon, Mr. Evelyn, and others.

On the contrary, says the last mentioned of these writers, some ground is so cold, as naturally to bring forth nothing but gorse, broom, holly, yew, juniper, ivy, box, &c. which may perhaps direct us to the planting of pines, firs, and other perennial verdures in such places.

Moss, rushes, wild tansy, sedge, flags, fern, yarrow, and withered, blasted, shrubby, and curled plants, are natural indications of a very bad soil.

The nature of the ground may also be pretty well guessed at, by the quality of the water which runs, or is strained through it.

By the smell, which, upon the falling of the first rains after a long drought, is very pleasing, and even fragrant, from good and natural mould; but disagreeable and noxious, if the ground contain any mineral, or other ill quality, as is remarkable in marshes and fenny places.

By the taste, all earths, as well as plants, abounding more or less in their peculiar salts; some sweet and grateful; others bitter, hot, or astringent; and others flat and insipid; easily discovered by the method which Columella directs, of digging up some of the under mould, out of that part of the land which is deemed the worst, and mixing it thoroughly in an earthen vessel, with sweet water, which, when poured off after the grosser parts have subsided, will retain the taste of the earth soaked in it.

The touch will immediately shew whether it be soft, pliant, fat, and slippery; whether it sticks to the fingers, or melts and dissolves on the tongue; in which case the soil may be deemed rich. If it be gritty, light, and porous, it is bad.

Mould fit for the production of plants is of an uniform substance, unmixed with the contrarieties of soft and hard, churlish and mild, moist and dry: neither is it too unctuous or too lean; but light, and crumbles easily; yet is consistent enough to be wrought and kneeded. It is of such due tenacity as to retain a just degree of moisture, and neither soils the fingers, nor cleaves much to the spade, which easily enters it. Of this kind is the soil usually found under the turf of pasture-grounds, upon which cattle have been long fed and foddered. In short, that is the best mould which is blackest, cuts like butter, sticks not obstinately, breaks into small bits, smells sweet, is tempered without crusting or chopping in dry weather, or becoming poachy in wet, which shines after the plough, where flocks of crows follow the ploughman, and, as Pliny expresses it, peck at his very heels.

As to colour, next to the blackish, the pre-eminence is generally given to the darker gray, and after that to the russet: the clear tawny is reputed worse; the light and dark ash-colour (light of weight and resembling ashes) good for very little: and the yellowish red, the worst of all.

The common opinion, that all hot grounds are red or brown; cold and dry, blackish; cold and moist, whitish; hot and moist, ruddy; is, notwithstanding the specious arguments alledged in favour of it, from the exhalation of minerals, the heat of the sun, and other accidents, exploded by Columella, who proposes, as a much surer way to judge of the goodness of land, digging a trench, and afterwards throwing back the same earth that was dug out, treading it down well when it is returned. If, says he, through a kind of ferment as it were, there be more than enough to fill the trench, it is a certain sign that the soil is fat: if there be not enough, we may be sure that it is poor and lean; and if the quantity be just sufficient to fill the hole from whence it was taken, it is of a middling quality.

Mr. Evelyn, after examining the component parts of several sorts of soils, concludes, that the very finest earths and best moulds, however to appearance mixed with divers imperfect bodies, may, for aught we know, consist more of sandy particles, than of any other whatever. Hence he infers, that earth, stript of all heterogeneous particles, retains only weight, and an insipid siccity; and doubts whether it afford any thing more than embracement to the first rudiment of plants, protection to the roots, and stability to the stem; being "unprolific till married to something of a more masculine virtue, which irradiates her womb: but, otherwise, nourishing only from what is added, without any action or material contribution: for, says he, what gives the divers tempers to moulds, seems rather to be caused by the perpetual and successive rotting of vegetable and animal substances, than by any peculiar and separate principle; the clamminess of the earth seeming rather something extrinsical and accidental to it, than natural and originally constitutive. We know indeed, that the earth is, without any artificial auxiliaries, indued with a wonderful prolific virtue: but as this is liable to be lost, or to decay, and never can be expected from some grounds, without helps; it may be worth our while to consider, by what expedients the desired effect of perpetuating its vigour may best be accomplished."

The means of giving and perpetuating this vigour now becomes properly the subject of our farther enquiry, consistent with what was observed before, that in order to the earth's having this vigour, it should be constantly kept in an alkaline or calcarious state. Mr. Evelyn is clearly of this opinion, when he says, "I firmly believe that were salt-petre to be obtained in plenty, we should need but little other compost to meliorate our ground." In other words, could the earth be always kept in a state fit for collecting nitre, it would consequently be always in a state fit for the production of plants. They who are acquainted with chemical researches, know, that nitre is obtained from substances of a mixed nature. Its basis is a calcarious earth, to which must be added putrid or alkaline substances, especially of the vegetable kind.

Mr. Evelyn and some later writers have spoken so much of the effects of nitre, and nitrous earths, in vegetation, that many have imagined nitre to be essentially necessary in the growth of plants: though Dr. Woodward assures us, that, by all the trials he has been able to make, the very contrary seems to be the case; for that nitre, when contiguous to a plant, rather destroys than nourishes it. When, therefore, they mention nitre, and nitrous earths, it is more than probable that they mean earth in a state fit for collecting nitre: but when the alkaline substances are once saturated by the acid in the air, or when the alkali is brought to a neutral salt, as nitre is, its fertile state then ceases, and it becomes a hard compact body, much more impervious to the roots of plants than it was before.

The nature of calcarious substances, and that of the two kinds of alkalis, viz. the fixed alkaline salt of plants, and the volatile alkali arising from animal and putrid vegetable substances, has already been explained.

Farmers commonly say, that lime (to which might be added all other calcarious substances) does not fatten, but only mellows the earth; meaning, according to Dr. Woodward, that it does not contain in itself any thing of the same nature with the vegetable mould, or, in other words, afford any matter fit for the formation of plants; but that it only softens and relaxes the earth; by that means rendering it more capable of entering into, and of nourishing the seeds and vegetables set in it, than it would otherwise be. It is well known how apt lime is to be put into a ferment and commotion by water. Now this commotion can never happen when the lime is mixed with earth (and it retains its qualities of lime) however hard and clodded the ground may be, without opening and loosening it. What Dr. Woodward ſays of ſalt in general, may more properly be applied to the fixed alkaline ſalt of plants. Every one, ſays he, muſt have obſerved, how apt all ſorts of ſalts are to be wrought upon by moiſture, and how eaſily they melt and run with it. When this happens to thoſe that are in the earth, the clods which they are mixed with, moulder and fall aſunder. The ſame gentleman farther obſerves, that if we would render the earth truly fruitful, it muſt be by the addition of ſuch ſubſtances as former crops have robbed it of, or ſuch as contains in itſelf vegetable matter.

The ſeveral manures which are found beſt to promote this end, are chiefly, either parts of vegetables, or of animals; of animals, ſays the doctor, which either derive their own nouriſhment immediately from vegetables, or from other animals that do ſo, and which, being returned to the earth, ſerve for the formation of other ſimilar bodies. Theſe vegetable and animal ſubſtances, are the matter from whence Mr. Evelyn thinks the earth derives that clamminess which he takes to be a ſure indication of a rich ſoil.

If the effects of the putrefaction of vegetable or animal ſubſtances, when mixed with, and ſeparated in the earth, be duly attended to, we ſhall find this a very probable opinion. Vegetables, or animals, if expoſed to the air, ſoon putrify and fly off into the air: but when they are divided into ſmall portions, and mixed with the earth, the earth renders the progreſs of their putrefaction ſlower, and intangles the volatile alkaline particles, which would otherwiſe fly off into the air. Theſe are not only ſtrongly attractive of moiſture, but, like the fixed alkali, attract the acid in the air, and effervesce with it; whence the double advantage of a moiſt and looſe ſoil.

If we attend to the infinite number of animals and vegetables which are rendered volatile by putrefaction, and fly off into the air; and to the quantity of perſpirable matter from animals and vegetables ſent into the air; and alſo to the effects of the acid found every where in the air on ſuch ſubſtances mixed with the earth; we need no longer wonder at the efficacy which writers, in all ages, have aſcribed to the air, with regard to its quality of enriching the earth.

That the peculiar richneſs of ſoils is owing to the putrid or rotten particles mixed with them, is an opinion of long ſtanding. This is Virgil's *putre ſolum*, rotten, crumbling, or looſe earth; and that which Columella diſtinguiſhes by the appellation of *pinguis et putris*, fat and rotten, or fat, looſe, and crumbling, as the ſoil which yields the greateſt profit with the leaſt labour and expence, becauſe it is naturally neareſt that ſtate which cultivation is intended to effect; "for, to cultivate, is no other thing but to open, looſen, and ferment the earth."

From theſe principles it is that we account for the appearances before-mentioned of good ſoils, ſuch as, their blackiſh or dark colour (which is that of all ſoils in a putrid ſtate) their ready crumbling, eaſy mouldering, fragrance of ſmell, &c.

Mr. Evelyn conſtantly imputes the fruitfulneſs of the earth to a nitrous ſalt: but if theſe rich putrid ſubſtances are ſubſtituted inſtead of that ſalt (and it ſeems highly probable that he means them) we ſhall find that his reaſoning will appear full as ſtrong, more intelligible, and indeed more rational. The ſubſtance of p. 312, and 313, of his Philoſophical Diſcourſe of earth, ſo far as relates to this matter, will run thus:

"It is this putrid quality which entices roots to affect the ſurface of the earth, upon which the fertiliſing rains and dews deſcend; which makes all covered and long ſhaded earth, abound in fertility; which reſuſcitates the dead and mortified earth, when languiſhing and ſpent by our indulgence to her verdant offspring; her vigour being quite exhauſted, till the rains and ſhowers gently melt into her boſom what we adminiſter to ſupply that which has been conſumed. It is this which fertiliſes and renders Egypt ſo luxuriantly fruitful after the inundations of the Nile, &c."

GROUND-IVY, the name of a trailing plant, which ſtrikes out roots from the joints of its ſtalks: but as it generally grows under hedges, and upon the ſides of banks, it cannot be of any great diſadvantage to the ſoil.

GRUB, the name of a large maggot, produced from the eggs of a certain ſpecies of butter-fly. It is of a large ſize, and often does great injury to the corn by undermining it, and preying on its roots. It produces the beetle, and is by ſome called the rook-worm, becauſe rooks are particularly fond of it. The beſt way of deſtroying the grub, is good and frequent ploughings, which will clear the ground however infeſted with this inſect, for ſome years at leaſt.

GRUBBING, the clearing of lands from the roots and ſtumps of trees, buſhes, &c.

Mr. Worlidge rightly obſerves, that the beſt and cheapeſt method of grubbing up thorny ſhrubs, broom, graſs, &c. is ingeniouſly delivered by Gabriel Platt. The inſtrument he has recommended for this purpoſe reſembles a three-grained dung-fork, but much larger and ſtronger, according to the bigneſs of the ſhrubs, &c. the ſtale thereof reſembling a large and ſtrong lever. This inſtrument being placed about half a foot, or any other reaſonable diſtance from the root of the ſhrub, &c. and driven to a good depth, with a ſtrong hedging beetle, then raiſed by laying under it a ſtone or log of wood, is pulled down by means of a rope faſtened to the upper end of the ſtale, and the whole buſh wrenched up by the roots.

GUTTERING-*Plough*, a ſmall and ſimple inſtrument uſed in ſome counties for draining wet lands.

It is ſmall, and worked by a ſingle man. A trench four or five inches broad, and ſix or eight deep, may be eaſily made with it; and on that account it is much uſed for making drains in bleaching grounds, and may do very well for wet clay meadow-land, where the ſoil is ſhallow, and apt to produce a large quantity of ruſhes.

It conſiſts of a piece of iron about five inches broad, and pointed at the end. Upon this piece two other pieces are fixed perpendicular to the former, one on each ſide, the fore-edges inclining backward; ſo that the three edges of the inſtrument form a capital A. To the bottom plate is fixed a ſocket, for receiving the ſtale, which is ſet higher or lower by means of a wedge on the under ſide. At the end of the ſtale is a croſs piece three feet long, againſt which the man's breaſt is placed when he ſhoves the inſtrument before him in order to cut the drain. A rib twenty-four inches long is fixed on the ſocket, and at the end of it a peg about a foot long, and two inches diameter is faſtened to the ſide of the ſtale with ſcrews. This peg reſteth on the land, when the clod is turned out of the mouth of the inſtrument.

H.

HACK, a pick-axe, or mattock, having only one, and that a broad end.

HARE, a mift.

HARROW, an inftrument for breaking the clods of earth, and covering the corn when fown. It is a fort of wooden drag, made in the form of a fquare, with large iron-teeth or tines. The reader will find different forts of harrows defcribed under the articles BEANS, LUCERNE, &c.

HART-CLOVER, melilot.

HARVEST, the feafon when the corn is ripe, cut down, and carried into barns, &c.

Wheat which is full of weeds ought to be cut three or four days fooner than ordinary, that the weeds may have time to wither before the corn become too ripe: for if it be not cut till the grains are full ripe, it will be liable to confiderable damage by fhedding, lofs of colour, and injuries from rain, whilft it remains expofed for the weeds to dry. A fingle fhower, indeed, or even a day's gentle rain, whilft it lies in fwarth, is thought to be rather beneficial to the grain, by making it feel dry and flippery, and threfh the better: but all poffible care fhould be taken to guard againft its being wetted too much. When, through any unavoidable accident, it is laid up not thoroughly dry, though it will not take much harm in the mow, it will fweat and cling together when laid in a heap after being threfhed, and look as white, with mouldinefs, as if it had been ftrewed with flour. Such corn will not keep, and therefore fhould be fent to market, and fold, as foon as it is threfhed.

In Oxfordfhire, and feveral other countries, they bind up their wheat in fheaves, though it be full of weeds, and fet three fheaves fomewhat floping againft three others, after which they cover their tops with two fheaves opened at their ear ends, which are extended and placed downward. In this fituation they let their wheat ftand three weeks or a month in the field, before they carry it in; for no wet can hurt it, nor is it apt to grow in the ear, when thus fheltered.

In their wheat-pooks, as they call them, in Wiltfhire, the fheaves are fet in a circle, with their ears uppermoft, and another circle of fheaves is placed upon that, and fo on, contracting each round, till the pile ends in a point, upon which a fheaf opened, and turned with the ears downward, is placed, like the fhackle of a hive; for an ear turned downward will not grow, though ever fo much wet fall upon it, and the bottom of a fheaf being broader than its top, every upper one fhelves over the under, like the eaves of a houfe. A load, or two loads, may be thus put into a pook, which is a very good way to fecure corn againft rain, and to give the weeds among it time to dry. But, as Mr. Lifle rightly judges, this method is not altogether proper when the wheat is intended to be laid up in a rick; becaufe, if the weather prove wet, mice will run to it for fhelter, and will be carried in with the pooks. It is the general way of making wheat-ricks in the ifle of Wight, without thatching.

Though moft corn is bettered by lying awhile in fwarth, or grips, to take the dews, which contribute to render its grain plump and of a good colour; yet its ftraw becomes thereby the worfe for fodder, unlefs it was cut before it had attained full maturity, and lies out no longer than till it be fufficiently ripened.

In hot dry fummers, when the corn ripens fully, and its own vigour gives it a proper colour, and plumps up the grain fo that the hufks readily yield their contents when threfhed, wheat need not lie out in grip, before it is fheaved, or in fheaf, unlefs it be very full of grafs and weeds: but in cold fummers, the wheat is horny and pale, the grains are thin and require being plumped, and their hufks cling fo clofe, that they muft be mellowed, in order to make them threfh well. The full grain which fwells the chaff, even till it opens, in good and fruitful years, lies almoft bare to every moifture; and the heavy ears then fpread and hang over the fheaf, which of courfe opens wider, and lets the rain into the bonds fooner than in lefs kindly feafons, when, the wheat being light, the ears in the fhock ftand more upright and clofer together.

In proportion to the heat of the weather, greater expedition is neceffary in reaping; for corn, when haftily ripened, fcorched up by the fun, and full in grain, foon takes a ftain, is damaged by wet, and eafily fheds at every blaft of wind. The prudent hufbandman fhould therefore, in fuch cafes, employ the greater number of reapers; for he cannot defire more, than that his corn be perfectly ripe, and of a good colour: for which reafon, the lefs it then lies abroad in grip or fheaf, the better it will be. Cutting it high up, fo as to avoid the intermixed grafs as much as poffible, by which means it is the fooner fit for carting, has been found very ferviceable on thefe occafions; and Mr. Lifle is of opinion that, efpecially in hilly countries, corn can never be better houfed, if thorough ripe, hard, and not weedy, than by gripping and carting as faft as it is cut down; becaufe the dampnefs which it takes by lying on the ground all night, is not eafily removed.

It is always moft advifable to turn the grips of wheat which is left out, very early after their being cut down, in order to get them dry as foon as poffible. By this means they are kept the longer from fprouting in the ear, in cafe of rain: for if dripping weather or driving mift fhould enfue, and continue for any time, after they have been already loaded with wet, all the art of man cannot prevent their growing: nay, even independent of other accidents, the bare weight of the ears will fink the grips of wheat to the ground, though they have been laid ever fo

light

light and hollow; and they will certainly be injured thereby, if fuffered to lie long out in wet weather. The beft method of guarding againft this, is by laying them in triangles, as directed by M. de Lille.

A principle fomewhat fimilar to this feems to be the reafon why the farmers in Leicefterfhire, and Northamptonfhire, in particular, where the land is rich, deep, lies flat, and is much inclofed, leave a very high wheat ftubble, upon which the grips are fupported, lie the hollower from the ground, and confequently are the eafier dried by the fun and wind; for it is to be obferved, that the fatter and richer the foil is, the fooner the grips will grow after they have taken wet, if they lie upon the naked ground; much fooner than they would, in the fame cafe, in a hilly country, where the land is poor. Hufbandmen there, befides efteeming it an advantage that they can ftow a greater number of fhort-cut fheaves in their barns, think the lofs of the ftraw compenfated by the excellent thatch which they make of the ftubble. In fome places they mow it for drying malt.

The forwarder the harveft is, and the warmer the feafon, the longer the corn may fafely lay in the field, either in grips, or fheaves: for this expofure to the air, after it is cut down, mellows it, and makes it threfh better and look finer. Thus, when the wheat harveft takes place by the middle, or at leaft before the latter end of July, of which we have had inftances, there can be little danger in letting the wheat lie abroad four or five days or a week, if it be not over ripe when cut, even though a rainy day or two fhould come: for at that time of the year the fun is fo hot, the days are fo long, the grafs fo fhort, and the dews generally fo little, that the corn foon dries, even after a hard fhower; whereas in the middle, and ftill more toward the latter end of Auguft, the rainy feafon frequently begins, the dewy nights grow fo long, the grafs is fo rough, and the fun's drying power fo much abated, that, if wet weather comes on then, the corn will be much more apt to grow.

A caution which Mr. Lifle recommends as fingularly important in hilly countries, is, not to bind the grips of wheat up into fheaves too early in the day; becaufe, in fuch a fituation, the grips take fo great a damp by having laid on the ground, that, though the ftraw, and chaffy ears may feem to be dry when the dew is firft gone off, and after the fun may have fhone an hour or two upon them, yet there will remain an inward dampnefs in the corn, and within the ftraw, which, if laid up in that condition, will come damp from the rick or barn at threfhing time. The afternoon is therefore certainly beft for gripping and binding into fheaves in fuch countries, but fo that this work may be finifhed before the day is over. The bands fhould, however, be laid in the morning, that they may not crack; for the ftraw will not twift after the fun is up, but will be brittle, and break off below the ears. The turning of three or four of the ftubble or bottom ends of the ftraw to the ears of the band, helps greatly to add to its ftrength and toughnefs.

The bands for binding up the fheaves fhould not be fpread but in fair weather, becaufe, being preffed down by the grip or two which it is neceffary to lay upon them to keep them in their places and prevent their being untwifted by the fun, they will grow fooner than any other corn, if rain fhould come; for they cannot dry, on account of their lying undermoft. But though the bands muft always be made while the morning dew is upon them, the fheaves ought not by any means to be bound up wet: if they are, they will certainly grow mouldy.

Farmers do not always attend fufficiently to the binding up of their fheaves, but fuffer the reapers, for difpatch, to tie the bands juft underneath the ears, inftead of binding them at the other end; the confequence of which is, that they will hardly hold together to be flung into the cart at harveft, and will certainly be in great danger of falling to pieces before they are threfhed.

If a little rain is forefeen in harveft time, it is beft to bind the grips up into fheaves as faft as they are made; becaufe fmall fhowers will wet the fingle grips fo much that they cannot be bound up, and thofe fhowers may be the fore-runners of greater rains. The fheaves, being bound, will foon dry after fuch wet. But if a hard rain is forefeen, the beft way is not to bind up into fheaves, becaufe they will then be wet to the bands, and muft all be opened again. One of Mr. Lifle's neighbours, to whom this happened, unfheafed fome of his wheat to dry it, opened it, and turned it fo often, that the ears broke off, by which he loft half his corn. Caution ought therefore to be ufed in this cafe, left by curing one evil we create a worfe.

All farmers agree, that rain which comes with a driving wind, is the worft of any weather for fheaves of wheat out in the field; and that it is worfe than a downright foaking rain for fuch fheaves as are wet to the bands.

In a wet harveft, fmall fheaves are beft, becaufe, thin at top, and falling clofe, the rain does not fink down into the middle of them, and fo go through into the bands, as it is apt to do in great fheaves, which lie broader, and take a larger compafs. Small fheaves are alfo beft, when many weeds are intermixed with the corn, becaufe the air, wind, and fun, have then a greater power to dry them, than they could have if the fheaves were large.

It has been the opinion of fome good farmers, that if the weather be likely to continue fair, it is beft to lay the fheaves, the night after the wheat is cut, one by one, flat on the ground, in order to make their ftraw lie the clofer together, and their ears ftand the ftiffer, and more upright, by which means they will be lefs apt to open at the top, and rain will have the lefs power to penetrate them when laid in fhocks.

Reapers fhould take care, in placing their grips, to lay the ftraw end in the furrow, and the ears out, becaufe thefe will then ftand floping up, and lie tolerably dry, even though rain fhould come; but in the other way, they would foon grow.

Mr. Lifle remarks, in his Obfervations (which might have been thrown into a more regular, as well as more laconic form, before they were publifhed; for that gentleman certainly never intended, that his unconnected notes and memorandums fhould appear in the manner in which he penned them merely for his own ufe) that "one of his reapers, when he had made up fome wheat into fheaves, the wheat being long-eared and lop-heavy, faid, rain had not need meet with thofe fheaves before they were carried home." Mr. Lifle afked him, "Why fo?" To which the other replied, "becaufe the ears being long and heavy, were bufsle-headed, that is, did hang their heads downward into the fheaf, fo that (in cafe a rain fhould run down to the bands) neither fun nor wind could enter in to dry them; whereas, faid he, when the ears are fhort, and not heavy, they ftand upright and hollow, fo that the fun and air may eafily dry them."

The ftraw of blighted wheat, being hollow and fpungy, is very apt to imbibe moifture; for which reafon the beft way is to houfe fuch corn as foon as it is tolerably dry, efpecially if there be the leaft profpect of rain; for if ftraw of that loofe texture fhould once foak in wet, and fhowery weather fhould afterward come on, it would require much more time than other corn to dry and fit it for threfhing.

Experience has fhewn, that wheat keeps better when ftacked in the ear unthrefhed, than its grain does alone, when threfhed out and laid up in granaries: befides which, a farther advantage which attends the ftacking of this corn, is, that the hufbandman need not threfh it but as his markets or other occafions require; whereas, if it were to remain long in the barn, he would not be able to preferve it from rats, mice, and other vermin, which harbour in the walls, roofs, &c. of fuch buildings.

To guard againft thefe enemies, as well as againft the dampnefs of the ground, which would otherwife occafion great lofs (for there have been inftances of its rotting piles of corn to the thicknefs of a yard, or more) four, fix, or more ftrong pofts, according to the intended fize of the ftack, are driven into the ground, beams of a proper ftrength are laid acrofs them, and upon thefe is made a floor to fupport the ftack. Some farmers build thefe platforms for their ftacks fo high from the ground, that there is room to fhelter their carts and other implements of hufbandry under them: and fome again, as an additional fecurity againft rain and birds, erect fides and a roof, by which means they form a kind of barn:

barn: but this is needlefs, if the corn be ftacked, as it ought to be, in fheaves, with the ears turned inward, and the ftraw ends outward, and the top well thatched with good wheat ftraw, which is the beft of any for thatching. They likewife cover the fupporting pofts with tin, for about a foot in breadth from the top, to prevent the mice and rats getting up: but this method foon proves ineffectual, becaufe tin is very apt to ruft, and confequently lofes its fmoothnefs. A better way, as Mr. Mortimer advifes, is to cover thofe pofts with Dutch tiles, fuch as chimnies are commonly fet with, becaufe they will always keep fmooth. Others make their fupporters of two hewn ftones, one of which, being about three feet high, and floped from the bottom, where it is two feet wide, to the top, where it is but a foot thick, ftands upright, and is covered with a large flat ftone, about a yard fquare, or, which is better, of a round form. This not only prevents rats and mice from climbing up, but is alfo a fecurity againft the dampnefs of the ground. Others again, whofe method is the beft of all, lay a foundation of brick as wide as the ftack is intended to be, and build round it a brick wall, about two feet high, capped with hewn ftones, which project fufficiently outward, to hinder the afcent of any fort of vermin. If either rats or mice fhould, by the help of any thing accidentally refted againft the ftack, chance to climb up, and get into the corn, they will not be able to remain there long, becaufe, as they cannot live without water, neceffity will force them down, and their former means of climbing being removed, they cannot get up again. If any of them chance then to be left in the ftack, they will foon die there for want of drink.

Particular care fhould be taken in the ftacking of wheat, always to lay the ear ends of the fheaves inward, and upon a rife, fo as to keep the middle of the ftack full while it is worked up: for in this cafe, when it fettles, the finking will be chiefly on the outfide, which will thereby be made to lie the clofer, and the ftraw ends being outward, and inclining downward, birds cannot get at the grain, nor can rain be driven up to the ears. The fhorteft and thinneft fheaves fhould be ufed in the topping of the ftack, becaufe it cannot be fo conveniently drawn in and narrowed with great long fheaves. They fhould be taken from off the fame ground, if the hufbandman wants to keep any particular fort or growth of corn pure and unmixed. Where lefs nicety is obferved, oats, or fome other kind of coarfe grain, are frequently laid on the top of the ftack of wheat, under the thatch, the better to preferve it from being wet. Wheat, properly ftacked, will keep in perfect order for many years.

Mr. Lifle, who does not approve of ftacking any corn but wheat, when room can be found for it in the barn, thatched a long rick of vetches, brought up fharp, with barley ftraw, to the thicknefs of three feet, and yet found, upon cutting it, that the rain had penetrated through this thick covering, and done confiderable damage to the vetches. He imputes this, firft, to barley-ftraw's being more woolly and fpungy than wheat ftraw, which is clofe and hard; and, fecondly, to the ftack's having fweated and heated pretty much, in which cafe the covering of ftraw is always hollowed and foftened, and confequently rendered the more apt to admit and retain wet.

The ftalks of oats are naturally fo fmooth and flippery, that they are apt to flide in the ftack, which then frequently tumbles down, efpecially if this corn was very dry when carried in. An oat rick muft therefore not be widened by any means beyond its foundation, which generally is of faggots, nor fhould its fides ever bulge out, but, on the contrary, they fhould be gradually contracted. Barley, having a rough ftem, may be piled more upright.

When fparrows rooft at night in holes, under the eaves of a ftack of corn, it is reckoned a fure fign that there are neither rats nor mice in the rick; for their fqueaking and running about in the night, would difturb the birds, fo that they would not ftay there.

HASK, a hufky cough.

HATTOCK, a ftock of corn, confifting of twelve fheaves. In fome countries it implies only three fheaves laid together.

HAVER, a name given to oats in fome parts of England.

HAW, a clofe, or fmall field.

HAW, is alfo the common name for the fruit of the white thorn.

HAW, likewife fignifies a fwelling of a fpongy texture, growing in the inner corner of the eye of a horfe, and fometimes fo large, as to cover a part of the eye.

HAY, a general name for any kind of grafs, cut and dried for the food of cattle.

When grafs is to be made into hay, the farmer will be directed in the feafon for mowing it, by the quality of the grafs. When the crop is very great, it fhould be cut as foon as the bottom of the grafs grows yellow: for if it ftands longer, more will be loft by the quantity of leaves rotted at the bottom, and the ill flavour which thefe will give to the reft, than will be gained by its growth. When other circumftances permit the choice of time, it fhould be when the grafs is in full bloom, before the ftalks begin to harden, and rather early than late, becaufe the more fap remains in the roots, the fooner the next crop will fpring up. There is not, however, any general rule for this; becaufe, in fome cafes, the ripe feeds add a great value to the hay, as in fainfoin and burnet; and, in others, the growth of the grafs itfelf brings a recompenfe, as in the fowl-meadow grafs.

A dewy or dufky morning fhould be chofen for cutting the grafs, becaufe, being then fulleft of fap, it ftands beft to the fcythe. When the high noon-tide fun has dried the grafs, and made it recline its head, the mower will employ his time more ufefully in making the hay already cut, than in continuing to mow, with great additional labour, grafs, which no longer makes the due refiftance.

Our farmers in general are very inattentive to the management of their hay whilft in the cock, to which is in a great meafure owing the lofs which they (or rather the nation) fuftain every year, by the damage which the hay receives from rain.

To guard as much as poffible againft this accident, let the hay-makers follow the mowers, and, if the weather be quite fine, fpread out the grafs as faft as it is cut down, efpecially if it lie fo thick in the fwarth, that neither the air nor fun can pafs freely through it: but if wet be feared, let it remain in the fwarth. At night, make it into grafs cocks, and the next day, as foon as the dew is off the ground, fpread it again, and turn it, that it may wither on the other fide; then handle it, and if you find it dry, make it up into large cocks. If the weather continue favourable during the fecond day, the grafs will, by that time, be fo dry as to bear being kept in thefe cocks till the day on which it is be carted, when it fhould be fpread out again in the morning, to receive a farther drying, if wanted. If thefe cocks are made as tall and as taper as can be, confifting with their ftanding fafely, the winds, by paffing through them, will dry them gently and equally; and though rain fhould fall upon them, it will not do much hurt, becaufe the greateft part of it will run off directly, and the fun and wind will foon dry that which may have penetrated into the cocks. Thefe cocks have therefore a great advantage over the common fmall and low ones: for if a rainy feafon comes on, thefe laft will be fo thoroughly wetted, that the wind will not be able to pierce fufficiently to dry them. More hay is, perhaps, loft for want of making the cocks properly, than by all the rains which happen in the hay-making feafon.

The method here recommended is confirmed by the experience of a New England hufbandman, whofe account of it to the reverend Dr. Elliot run thus:

"I fhall relate to you my own practice in making of hay, though it may feem fmall and trifling at the firft mentioning: but finding that it faves me near two fifths of the time and labour I ufed to be at in this article, and that my hay is, I think, better than when I ufed to purfue the ufual method, I efteem myfelf juftified in communicating it to the public. My method is this: I mow my grafs, and let it lie in the fwarth till the dew is off the next morning: then I turn and fpread my hay, and let it lie in the fun till the after part of the day, when I take it up and cock it well, and never meddle more with it, till I cart it into my barn, or ftack it. If the weather be good, it will do well to cart after it has ftood two days in cock. This, I have found by five or fix years conftant experience, anfwers for any fort of hay, except falt-hay and red clover, of which laft I have not had fo long trial: but with refpect to clover hay, I managed it laft fummer after this manner, viz. I followed my mowers, as they cut the grafs, I fpread it as thin as I could, and before night I put it in cock. The next day, after the dew was off, I fpread it again; in the afternoon, I cocked it a fecond time, and meddled no more with it till I carried it. The appearance of the hay fince, makes me judge that no man has better of the fort. My firft coming into this practice was purely accidental. After cutting my grafs, five or fix years ago, I put it in cock the next day; but my avocations then were fuch, that I had no time in which I could poffibly take any farther care of my hay for many days. When I had difpatched my other affairs, I returned to it, and found it in as good order (that is to fay the bulk of it) as ever I had hay in my life. Reflecting then, how much labour may be faved by this method, I have followed the fame practice ever fince, and find it anfwer very well. The reafon why I think my hay really better is, becaufe I take it for granted, that the more juice or natural moifture we can retain in it, without corrupting and rotting the ftalk, the richer and more nourifhing it is. The too often turning and fpreading of hay in the fun extracts too much of the richnefs thereof; and one day's thus lying will take away fuch a quantity of the moft watery particles, as that the remainder is only fufficient to raife a proper fermentation thereof when in the cock, while the fmallnefs of the body there keeps that fermentation from rifing to fuch a height as to corrupt it. After twenty-four hours, the fermentation will gradually abate; and the pitching of the hay into the cart, and afterwards into the mow, or ftack, fo checks it, that it will not again rife to fuch an height as to be detrimental. Cattle are fonder of this hay, than of that which is made in the common way, and lefs of it will fupport them."

It would be almoft needlefs to obferve, that no narrow wheels fhould ever be brought upon paftures, not even in the drieft feafon of the year, as that of hay-making generally is. The advantages of broad wheels, which help to roll and level the ground, and render the draught much eafier, whether on grafs, or any other foil in which narrow wheels will fink, have been confirmed by experience; and are as felf-evident, as it is that the latter crufh and bury, and thereby deftroy great numbers of the plants of grafs, wherever they are dragged.

If the hay has fweated a little in the cock, there will be the lefs need for its fweating afterwards in the rick, where it will then lie fo much the clofer, and confequently keep the better.

For the method of making lucerne and faintfoin, *fee the articles* LUCERNE *and* SAINTFOIN.

HAY-BOTE, a liberty which a tenant for life, or a term of years, has of taking bufhes, wood, &c. for repairing fences, gates, and the like. It alfo fignifies the liberty of cutting wood, for making rakes and forks ufed in making hay.

HAYN, or *Hayn-up*, implies the action of inclofing with a hedge, in order to preferve grafs-grounds from cattle.

HAZLE-*Mould*, a moderately compact earth, containing a large quantity of refin-coloured fand.

HEAD-LAND, the land running acrofs the others at the head of the field, left for the turning of the plough.

HECK, a door; alfo a rack for cattle to feed at.

HECKLE, an inftrument ufed in the dreffing of flax and hemp. *See the articles* FLAX *and* HEMP.

HEDGE. *See* FENCE.

HEIRS, young trees in coppices.

HEE-GRASS, ftubble of grafs.

HELM, a hovel; alfo ftraw prepared for thatching.

HEMP, the name of a plant too well known to need any defcription here; but it may not be improper to remark, that the flowers and the fruit (commonly called feeds) of hemp always grow feparately on different ftems, and confequently on different plants, as this never has more than one ftem proceeding from the root.

The flower-bearing fpecies, which is the *Cannabis florifera*, Off. *Cannabis erratica*, C. B. P. *Cannabis fœmina*, J. B. *Cannabis fterilis*, Dod. Pempt. and which is moft frequently termed female hemp, fhould properly be called barren hemp, flowering hemp, or male hemp, fince it is this which bears the *farina fœcundans*, or fecundating duft, without being impregnated with which the feeds that grow on the other ftems of the other fpecies would not come to maturity, or at leaft would not be capable of producing plants, when fown.

This other fpecies, which bears the feeds, and which botanifts diftinguifh by the appellation of *Cannabis fructifera*, Off. *Cannabis fativa*, C. B. P. *Cannabis mas*, J. B. *Cannabis fœcunda*, Dod. Pempt. and which is commonly termed male hemp, fhould be called feed-bearing hemp, or female hemp; becaufe it is this which, with the help of the impregnation it receives from the *farina fœcundans* of the male, produces feeds capable of yielding plants of either fpecies.

What may chance to be the future proportion between the number of male plants, and that of female, in a hemp-ground, cannot poffibly be gueffed at the time of fowing, as no fort of mark can be difcerned on the feed, by which they may be diftinguifhed: nor indeed can any judgment be formed in this refpect, before the male plants begin to flower, that is to fay, in general, till about two months after fowing; unlefs it be from a remark which the moft curious obfervers have made, that the male hemp is flenderer than the female, and that all its parts are more delicate: to which may be added, that the male plant is always forwardeft in its growth, and that it generally rifes about half a foot higher than the female; thereby plainly indicating it to be the defign of nature, that the fecundating duft which iffues from the flower may by that means be the more eafily conveyed to the grain on the feed-bearing ftalks, in order to its impregnating that feed.

With regard to the temperature of the air that is fitteft for the growth of hemp, M. du Hamel obferves, in his Treatife on Cordage, that this plant does not like hot countries; that temperate climates fuit it beft; and that it thrives very well in pretty cold regions, fuch as Livonia and Canada, which produce it in abundance, and very good. M. Marcandier is indeed of opinion, that though extremely hot countries are not favourable to its growth, yet, as this plant is but a fhort time in the ground, it may be cultivated in any place that is habitable by men.

The wife legiflature of this country has fhewn its opinion of the importance of raifing hemp in our own dominions, by the bounty given by parliament for the importation of it from North America; and our truly laudable Society for the Encouragement of Arts, Manufactures, and Commerce, has likewife judicioufly contributed to this defirable end, by offering a very confiderable premium to the cultivators of hemp in that vaft province of the Britifh empire.

The foil for hemp fhould be a foft rich loam, eafily brought into fine tilth; and it fhould be well manured. Newly broken up land is found to be peculiarly good for this plant; but flat grounds lying on the fides of rivers, and enriched by the fediment left on them when the waters overflow, are the beft of all for it. If hemp is to be fown on very ftrong foils, they muft be brought into fo good tilth, and be fo well manured, that their mould may remain loofe: in this cafe, fuch foils yield very great crops. Dry lands are not fit for hemp: it does not rife well in them, but remains fhort and ftinted in its growth, and its fibres are then generally too woody, which renders them hard. All thefe are confiderable defects, even for the coarfeft works. It is however true, that, in rainy years, it fucceeds better on dry grounds, than on moift: but as fuch years are not the moft common, the beft fituation for a hemp-ground is generally thought to be along the fide of a ftream, or of a ditch fo full of water, as that the water may conftantly be nearly on a level with the furface, but without overflowing it while the hemp remains on the ground.

It is the cuftom in fome countries to form hemp-grounds, which are appropriated folely to this purpofe: whereupon the author of a very judicious account of the culture of hemp, in the Memoirs of the Royal Society of Agriculture at Tours, juftly obferves, that, " befides that all foils de-

light

light in a change of plants, hemp is ſo far from impoveriſhing the ground, that the leaves which fall from it become a ſufficient manure, and the depth to which the roots go, eſpecially if the crop of hemp be great, leave the ground ſufficiently looſe to ſow upon it even a crop of wheat immediately after the hemp has been pulled, without any other expence than ſowing the ſeed and harrowing it in; or if turnips or a ſpring crop be more convenient to the farmer, theſe alſo will thrive well after the hemp. It is ſaid, that the hemp which grows on an eſtabliſhed hemp-ground is ſofter and more ſilky than that which is raiſed elſewhere: but the difference, if any, is very inconſiderable; for the hemp which grows in the other parts of Anjou, for example, is found to be as good as that which is produced by any of the few eſtabliſhed hemp-grounds in that province."

As it is eſſential to have the ground in exceeding fine tilth, the firſt ploughing ſhould be given it as early in the autumn as the huſbandman's other buſineſs will permit. Some are ſo curious in the preparation of their ground for hemp, that they give this firſt ſtirring by hand; and tho' it be a more tedious and more expenſive way than ploughing, they think that the difference of the crop repays them well. In whatever manner it be done, the ground ſhould be looſened as deep as poſſible, and laid rough, that it may be the better mellowed by the winter's froſt, eſpecially if the ſoil be ſtrong. If the hemp is to be ſown on ground purpoſely broken up, and which is covered with coarſe graſs, or other ſimilar productions, its ſurface ſhould be pared off and burnt; or it ſhould otherwiſe be brought to a perfectly fine tilth. The ground ſhould be ploughed again in February, or more early if the ſeaſon will permit; and then alſo ſhould be laid on the manure, whether of horſe-dung, or the ſcouring of ponds and ditches, after it has had time to ripen; for theſe are preferable to cow-dung; though all manures, which render the earth light, are fit for hemp. Mr. Du Hamel remarks, that marle is not, to his knowledge, uſed for this purpoſe. He likewiſe thinks, that it is beſt to dung the hemp ground every year before the winter ploughing, in order that the dung may have time to rot during that ſeaſon, and that the ſpring ploughing may afterwards mix it the more thoroughly with the earth; for all hemp grounds ſhould be well dunged at leaſt once a year.

To prepare the hemp ground thoroughly for receiving the ſeed, it ſhould have two or three good ploughings in the ſpring, or even more if the farmer's conveniency will permit, and the nature of the ſoil be ſuch as to admit of them; for the more frequently it is ſtirred in the ſpring, in proportion to the quality of the ſoil, the better the crop will be. About a fortnight or three weeks ſhould intervene between each of theſe ploughings, and they ſhould at laſt lay the ground quite ſmooth and even. If any lumps or clods of earth yet remain after all theſe ploughings, they ſhould be broken by hand: for the whole hemp ground muſt be as level, and of as fine a mould, as the beds of a garden.

The firſt ſpring ploughing ſhould be given acroſs the former; and before the next ploughing is the proper time to ſpread ſheeps dung, pidgeons dung, poultry dung, or whatever other ſuch like manures are uſed; though ſtill it is to be feared, that, if the ſpring prove dry, theſe hot dungs may burn the ſeed, which they would not do if they were laid on before the winter: but in this caſe a greater quantity of dung muſt be uſed, or leſs advantage muſt be expected from it.

The ſeaſon for ſowing hemp depends in a great meaſure on the quality of the ſoil. In dry light ground, it ſhould be ſown as ſoon as the danger of froſt, or other inclemency of the weather, is over, in the latter end of April or beginning of May, that ſo it may get up early, and, by covering the ground, prevent the danger of drought. In wet cold grounds, it ſhould be ſown later, that is to ſay, not till the ſun has exhaled the too great moiſture of thoſe grounds; and this may not be till the middle, or even the latter end of May. The author of the before mentioned account of hemp, in the Memoirs of the Royal Society of Agriculture at Tours, adviſes to ſow hemp even ſo late as the latter end of June, in caſe the ſeaſon for it be not favourable ſooner; and he obſerves, that the crop ſown then will be as plentiful, and of as good a quality, as if the ſowing had not been delayed ſo long, eſpecially if a very dry ſeaſon does not come on immediately after. The truth of this is evinced by the experience of thoſe who are obliged to ſow a ſecond, and ſometimes a third crop, when their former ſowing has miſcarried through the inclemency of the weather, and particularly of froſt, which is a great enemy to hemp. Another reaſon too, which he aſſigns in favour of late ſowing of hemp, is, that the huſbandman may by this means have an opportunity of deſtroying the firſt growth of weeds, which would choak the hemp, if it were ſown before they had come up.

The huſbandman ſhould be particularly attentive to the weather, when he ſows hemp; for the ſeaſon then ſhould neither be too dry, nor too rainy. If either of theſe is the caſe, he had better defer his ſowing; though he ſhould, if poſſible, always chooſe a time juſt after a gentle fall of rain.

The hemp ſeed that is ſown ſhould always be of the growth of the preceding year, becauſe, as it is a very oily grain, its oil is apt to become rancid, if it be kept long, and the ſeed then loſes greatly of its vegetative power, inſomuch, that, when it is two years old, many of the grains will not riſe at all; and if it be older, a yet leſs quantity will grow. Experience has alſo proved, that, as in other grain, ſo likewiſe in this, it is adviſable every ſecond or third year to chooſe the ſeed from a ſoil different from that on which it is to be ſown.

When the ſoil is deep, and in fine order, it is beſt to ſow this ſeed thick, eſpecially if the hemp be intended for fine uſes, becauſe the plants run moſt into height, when they ſtand cloſeſt together, and their fibres are then by much the finer. They ſhould not, however, ſtand ſo very thick as to choak one another; becauſe this would occaſion a conſiderable loſs of plants. It is therefore neceſſary to obſerve a medium, the knowledge of which is eaſily acquired by practice: and indeed, in general, hemp grounds ſeldom are too thinly ſtocked with plants, unleſs when part of the ſeed has been deſtroyed by froſts, drought, or other accidents. The uſual quantity is three buſhels to an acre.

As ſoon as the hemp ſeed is ſown, it muſt be carefully covered with earth, either by means of a harrow, if the ground has been ploughed, or with a rake, if it has been dug by hand; and beſides this precaution, the whole hemp ground muſt be conſtantly watered till the ſeed has riſen; for otherwiſe numbers of birds, and eſpecially pigeons, will deſtroy it entirely, without ſparing even the ſeeds that have been well buried. It is true, that pigeons and birds which do not ſcratch, do no great hurt to the grains of corn that are well covered with earth: but the huſks of theſe grains do not riſe up out of the ground with their green ſhoots, as thoſe of hemp always do; and then it is that theſe birds, miſtaking them for perfect ſeeds, tear them away with the young plants to which they adhere, and thereby commit vaſt havock. So greedy are the pigeons, in particular, after theſe ſeeds, that none of the common ways of frightening birds will keep them off: nay, M. Du Hamel aſſures us, that he has ſeen ſtrong men, and even dogs, ſo wearied out with fatigue, as to be forced to give up the taſk, when the hemp ground has been large. Happily this troubleſome work does not laſt long; for when the hemp has put forth a few leaves, it requires no farther tending.

Though hemp cannot be weeded without great hazard of damaging the crop, becauſe whatever plants of it are twiſted, bent down, or broken, through inadvertence of the weeders, or by any other cauſe, never riſe again; yet if the weeds are ſo numerous and rank, as to endanger their ſmothering of the hemp, it is neceſſary to root them out, and the moſt careful perſons muſt be employed for this work, which, when rightly executed, is alſo attended with this farther advantage, that the pulling up of the weeds looſens the ſurface of the earth, and thereby forwards the growth of the plants.

In very dry ſeaſons, it will be proper to overflow the hemp ground, if it can be done. To this end ſome authors adviſe letting in the water from the ditches, as is practiſed for rice grounds. If any parts of the hemp ground are in danger of being burnt up, it will be adviſable to water them, or perhaps rather the whole in ſuch caſe, even by hand.

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If, by any accident, the hemp grows very thin, so as to be thereby in danger of branching out too much, and of becoming woody; this should be an additional motive for keeping it perfectly clear of weeds, in order to let it remain for seed, which will be so much the better for the plants having stood thin.

The male hemp (which is the species that produces the *farina fœcundans*) ripens earlier than the female, generally by three weeks, or even a month: but the time of the ripening of either depends much on the nature of the soil. The male hemp shews its ripeness by turning yellow at top, and whitish at the bottom of the stem: but this sort, in particular, should be pulled rather before it is quite ripe, that is to say, while it is yet somewhat green; for if it be too ripe, its fibres will adhere so strongly to the reed, as not to be separated therefrom, without some loss; neither will they be soft, and consequently not so fit for domestic uses, as those of hemp that is pulled before it has attained to a perfect maturity.

The ripeness of the female or seed-bearing hemp, is known, not only by the same signs as that of the male, but also by the seeds beginning to turn brown, and by the capsules which contain them beginning to open.

As soon as the male hemp is ripe, it is pulled stem by stem, and with caution not to injure the female hemp, which, as we before observed, must remain on the ground some weeks longer, that is to say, till it also is ripe, and then it must likewise be pulled stem by stem.

Each handful that is thus pulled should consist of plants, as nearly as possible of equal length, and their roots in particular should be placed as even as can be. Some tie up each handful, especially of the male hemp, with a stalk of hemp, then lay it in the sun to dry its leaves and flowers, which they afterwards beat off, by striking it against a tree or wall; they then put several of these handfuls together, so as to form a pretty large bundle, and in this condition they carry it to the watering place.

I have just mentioned what M. Du Hamel says of the common practice of drying the hemp before it is steeped: but I must here observe, that it is a matter of doubt, whether this plant should be dried before it is steeped. Those who are for drying it first, say, that the hemp becomes thereby stronger than when it is steeped without having been previously dried: for my part, I must confess, that this drying seems to me to be a needless trouble; for as it is necessary in the steeping of hemp, that a certain degree of putrefaction should arise, sufficient to destroy the texture of that glutinous substance which connects the fibres to the woody part of the hemp, it certainly is more adviseable to lay the hemp in the water as soon as can be after it has been pulled, because the more there is of the natural moisture left in this glutinous substance, the sooner the putrefaction will begin. If, either by design or accident, the hemp has been dried, the putrefaction comes on more slowly and more unequally, and the fibres contract a hardness which the steeping afterwards will not easily correct.

The common height of hemp, when full grown, is from five to six feet: but M. Du Hamel remarks, that the stems of the hemp which is cultivated near Bischwiller, in Alsace, are sometimes upwards of three inches in diameter at their bottom, and above twelve feet high. These, indeed, are so deeply rooted, that even a very strong man can hardly pull them up.

When the female hemp is let stand till its seed is perfectly ripe, its bark becomes woody, and so coarse, that no future operation can bring it to a proper degree of fineness. For this reason, it is generally pulled before the seed is quite ripe: but as it is manifestly the husbandman's interest to sow none but the best seed, he ought not to grudge the sacrificing of the goodness of a small part of his hemp, to the superior advantage of obtaining perfect seed, by letting a proper number of these plants stand till their seeds have attained full maturity. The judicious M. de Chateauvieux, whose attention extended to the most proper method of cultivating every useful plant, did not neglect so important an object as the quality of the hemp employed in cordage, and the means of obtaining its seed in the greatest perfection. However, not having had opportunities of continuing his experiments long enough to draw certain conclusions from them, he invites all those who have the public good at heart, to make experiments which may lead to the utmost improvement of the culture of this plant: "but, says this friend of mankind, these motives of œconomy are vastly inferior to the inestimable advantage of saving ships, their cargoes, and their crews, which often depends on the strength of their sails and cables."

On the twenty-sixth of April, 1753, he sowed six beds with his drill plough, placing six rows in each bed. The beds were seven feet wide, and the soil strong, but in very fine tilth. He treated his plants with great care, according to the principles of the new husbandry: but both that and the ensuing year were unfavourable to the growth of hemp. However, he observes, in general, that his plants were five or six feet high, that their stems were large, and their bark very thick and strong. They were very fruitful in seed, especially the two outer rows, which had profited most by the hoeings. M. Aimen, from forty plants of hemp, raised in the common way, and which might be deemed fine ones, had only a pound and an half of seed; but a single plant which grew by itself, yielded him seven pounds and a half, of much better seed than any that is produced in the common way. From hence it results, that it must be of great advantage to the husbandman to set apart a spot of ground sufficient to rear thereon as many plants of hemp, as will afford him seed enough for the purpose of sowing, and to cultivate them according to the principles of the new husbandry.

In some countries, to complete the ripening of the seed, round holes are dug, about a foot deep, and three or four feet in diameter, in different parts of the hemp ground, and the handfuls of pulled hemp are set as close together as can be in these holes, with their seed ends downward, and their roots uppermost; after which, to keep them in this position, the whole is tied round with bands of straw, and the earth that was taken out of the hole is thrown up all around this great sheaf, so as quite to bury the heads of the hemp, which, when thus covered, heat by means of the moisture contained in them, in the same manner as a stack of green hay, or a heap of dung. This heat completes the ripening of the hempseed, and disposes it the more easily to quit its husks; and when it has been brought to this condition, the hemp is taken out of these holes, where it would become mouldy, if it were left longer in them. But, as is justly observed in the excellent Memoirs of the Royal Society of Agriculture at Tours, it is hard to conceive, how an operation which tends to bring on at least some degree of putrefaction, can ripen the seed; and therefore this must be at best a very dangerous practice, especially as a seed so very oily as that of hemp, and consequently so apt to become rancid, cannot but be liable to be rendered still more so by this degree of heat.

In other places, where the crops of hemp are great, the husbandmen do not bury the heads of their seed hemp in the manner above described, but only lay it in heaps, with the seed ends one against another: others, whose crops are smaller, content themselves with spreading upon the ground a cloth to receive their hempseed; and others again only spread their bundles upon a clean spot of ground, with all the heads turned the same way. The seed ends thus placed are beaten slightly, either with a stick, or a light flail. The seed which falls out easiest is always the ripest and best, and should therefore be reserved for sowing the next spring: and as to that which remains in the heads of the hemp after this operation, it is got out by combing the heads on the teeth of a ripple, which pulls off the leaves, the husks of the seeds, and the seeds themselves, all together. These are gathered in a heap, and left in that condition for a few days, in order that they may heat a little, after which they are spread out to dry, then they are threshed, and finally, the seeds are separated by winnowing and sifting. This second seed is much inferior to the first, and accordingly it is used only for extracting oil from it, or for feeding of poultry.

It is, on this occasion, justly remarked in the Memoirs of the Royal Society of Agriculture at Tours, that by the threshing of hemp there is always danger of bruising some of its seeds, and that the bruised seed will not grow, though it may be fit for yielding oil. Nor is this all; for by threshing out the seed, there is a mixture of imperfect seed with that which is fit for sowing; and this

this is the reaſon why huſbandmen have always found it neceſſary to ſow a greater quantity than would otherwiſe be requiſite, in order to make up for the uncertainty of its growth.

The method of ſeparating the fineſt grains of wheat for ſowing, by throwing the corn to a diſtance on a barn floor, is equally adviſable for obtaining the heavieſt and beſt hemp ſeed, where proper care has not been previouſly taken to provide ſuch. In this caſe, the ripple may be uſed to ſeparate the whole of the ſeed from the plant, and this will prevent the inconveniencies which ariſe from the threſhing or beating out of the ſeed.

The method of laying the hemp down in order to its being ſteeped, is to place it in bundles at the bottom of the water, there to cover it with a little ſtraw, to keep the dirt from ſticking to it, and then to load it with pieces of wood and large ſtones, to keep it down, ſo that it may be always five or ſix inches below the ſurface of the water.

The intention of ſteeping the hemp in water is, to make its bark part the more eaſily from the reed, and to deſtroy the outer ſkin; or, if I may here be allowed the language of anatomiſts, the cellular membrane which connects the hemp with the reed. All this is effected by only a ſmall degree of putrefaction, ſo that it is dangerous to let the hemp lie too long in the water, for it will then be over ſteeped, that is to ſay, the water will not only have acted upon the outer ſkin and the connecting fibres, but it will alſo have leſſened the longitudinal coheſion of the fibres; in ſhort, the hemp will be too much rotted, and in this caſe the ſtrength of thoſe fibres will be proportionably impaired. On the contrary, when the hemp has not lain long enough in water, its bark adheres to the reed, its fibres are hard, and they cannot ever after be rendered ſufficiently fine. There is therefore a medium to be obſerved; and this medium depends, not only on the length of time that the hemp is to remain in the water, but alſo,

1. On the quality of the water; it being ſooner ſteeped ſufficiently in ſtanding water, than in a running ſtream; and ſooner in ſtagnant putrid water, than in that which is clear.

2. On the temperature of the air; for it requires leſs time to be ſufficiently ſteeped in hot weather, than in cold.

3. On the quality of the hemp; that which has been raiſed on a rich mould where it has not wanted for water, and which has been pulled whilſt yet a little green, being ſooner ſteeped to a proper degree, than that which has grown on a ſtiff or dry ground, and which has been let ſtand till it was quite ripe.

In general, when the hemp has been ſteeped but a ſhort time, its fibres are thought to be the better. Hence ariſes the opinion, that hemp ſhould not be ſteeped but in hot weather; and for this reaſon alſo it is that many, when the autumn is cold, defer the ſteeping of their female hemp till the next ſpring. It is likewiſe for the ſame cauſe that ſome prefer ſteeping their hemp in ſtanding water, or even in ſtagnant waters, that is putrid, rather than in ſpring or running water.

M. Du Hamel, to whom we are indebted for the foregoing remarks, ſteeped hemp in different ſorts of water, and it appeared to him, that the fibres of the hemp ſteeped in putrid ſtanding water were ſofter than thoſe of that which had been ſteeped in running water: but they contract in water which does not run, a diſagreeable colour, which does not indeed do any real injury to the hemp, for that which has been thus ſteeped is afterwards the moſt eaſily bleached; but yet, as this colour diſpleaſes, and the hemp is the leſs ſaleable for it, endeavours are always uſed, if poſſible, to make a ſmall ſtream of water paſs through the ſteeping places, thereby to change the water in thoſe places, and to prevent its becoming putrid.

He ſucceeded likewiſe in rendering hemp fit to ſeparate from the reed, by ſpreading it upon a meadow in the ſame manner as is practiſed for bleaching of linnen: but he found this method tedious and troubleſome; nor did the fibres of the hemp ſo prepared ſeem to him to differ much from thoſe of hemp ſteeped in the common way.

He alſo tried the boiling of hemp in water, in hopes of bringing it ſpeedily to the ſame condition as it is in when taken from the uſual place of ſteeping: but when, after having been boiled upwards of ten hours, it was taken out of the water, in order to be dried, it was not at all fit for either peeling or breaking. It is true that, while it yet remained hot and wet, its bark ſeparated eaſily from the reed; but at the ſame time it peeled off like a ribbon; the glutinous ſubſtance which connects the longitudinal fibres, and makes them adhere cloſely to each other, not being at all deſtroyed, ſo that they could not be ſeparated, nor was it poſſible to divide them into fine threads. It is evident from what has now been ſaid, that no preciſe time can be fixed for the ſteeping of hemp; ſince the quality of the hemp, that of the water, and the temperature of the air, haſten or retard this operation.

M. Marcandier is of opinion that the fineſt and cleareſt water is always the beſt for ſteeping hemp; and he approves of the method of thoſe who make a kind of ditch on the edge of a river, where the water, being more ſtill and warm, ferments eaſily, and penetrates more quickly the parcels of hemp that are laid in it. When they are taken out of this ditch, it will be ſufficient to waſh them in the current of the river, which will carry off all the gum and mud that would otherwiſe cleave to them. He holds, that the hemp which has been ſteeped in rivers is always whiteſt, and of the beſt quality; and that that which has lain in ditches, pools, or reſervoirs of ſtanding water, is always of a bad colour, has a very diſagreeable ſmell, is loaded with dirt, and loſes a great deal in the dreſſing. Theſe are M. Marcandier's ſentiments on this ſubject; and if they are the reſult of his experience, as I preſume them to be, I cannot but regret his not having related the particulars of his experiments.

The judiciouſly accurate Memoirs of the Society which the illuſtrious ſtates of Brittany have eſtabliſhed for the improvement of Agriculture, Commerce, and Arts, are more particular in this reſpect, and conſequently more ſatisfactory. After obſerving, that it is ſtill undetermined whether hemp ought to be ſteeped in running or ſtanding water, that each cultivator of this plant gives the preference to the method he has been uſed to follow, and that naturaliſts have not yet written any thing deciſive on the choice of the waters fitteſt for this preparation, the moſt important of any that hemp undergoes, becauſe it is on this that the eaſe and goodneſs of the hackling, ſpinning, and fabricating in a great meaſure depends; the Memoirs, I ſay, of theſe zealous patriots inform us, that one of the members of their office at Rennes thought that this diverſity of opinions and cuſtoms might proceed from running water's being, in fact, always preferable in ſome caſes, and from ſtanding water's being always the beſt in others. For example; in cold and rainy years the plant muſt be weaker, longer green, and fuller of juice, than in dry years, in which laſt the hemp will be ſtronger, but at the ſame time harder and more woody. Why then, ſay they, very judiciouſly, ſhould it be expected that the ſame waters applied to ſo different productions, ſhould have a ſimilar effect upon each?

To remove all doubt in this reſpect, the Society ordered ſome hemp to be pulled in different parts of the province of Brittany, and in different ſtates of growth. Some was pulled before it was ripe, ſome exactly when it was ripe, and ſome ſeveral days after it was ripe. Each of the parcels of theſe three ſorts of hemp was divided into two equal parts, one of which was laid to ſteep in running water, and the other in ſtanding water. They were afterwards hackled with very great care, and examined with the moſt ſcrupulous attention, by a perſon thoroughly acquainted with the defects and good qualities of this commodity.

Minute accounts of every circumſtance attending theſe experiments, and of their reſult, were ſent to the office at Rennes; and the Society, ſenſible of the vaſt importance which the aſcertaining of this point may be of in many reſpects, deſired that they might be repeated in one and the ſame year on the hemp of all the diſtricts of the province, and the reſult of their firſt experiments was as follows:

1. There was a ſenſible difference between the ſame hemp pulled in the three ſtates before-mentioned. 2. All the

the hemp that was ſteeped in running water, was incomparably whiter than that of the ſame quality which was ſteeped in ſtanding water. 3. The hemp which was pulled before it was ripe, acquired the greateſt degree of whiteneſs. 4. The whole of the loſs of ſubſtance, upon ſumming up the waſte occaſioned by each particular preparation, was leaſt upon the whiteſt hemp; but that which had been ſteeped in ſtanding water yielded a greater quantity of fine fibres, and the great loſſes in point of quantity fell upon the firſt dreſſing. 5. The hemp which was judged to be the beſt before it was hackled, did not always preſerve its ſuperiority when hackled. That which was at firſt looked upon as only of a middling, or even of an inferior quality, proved to be the fineſt and beſt after it was hackled. This obſervation is of great importance, eſpecially when the hemp is intended for naval uſes.

"We ſhall not, add theſe truly intelligent patriots, limit our inquiries to a bare repetition of theſe experiments. We purpoſe to extend them further, in order to have facts which may be entirely relied on. We ſhall cauſe the beſt and beſt prepared of each different kind of hemp to be ſpun by the ſame hand, into as ſmall and fine threads as the hemp is capable of affording, that ſo we may judge to which of the different manners of ſteeping this plant the preference is due, by the greater diviſion of which its fibres may be ſuſceptible. Theſe threads ſhall be exactly weighed, and ſhall undergo ſimilar preparations in exactly ſimilar leyes; after which they ſhall be weighed again, in order to judge of their goodneſs by the diminution which each ſhall have ſuffered in the leyes, and by the degree of whiteneſs which each of them ſhall acquire. Theſe experiments, though extremely uſeful in themſelves, are, however, only introductory to a greater enterprize: they will lay a ſure foundation for the improvement of every manufacture of hemp, and particularly of ſail-cloth, which is an article of the utmoſt importance to all commercial nations."

The Memoirs of the Royal Society of Agriculture at Tours, for the year 1761, prefer river water, eſpecially that of rivers which run upon a bed of ſand, as the beſt for ſteeping of hemp; becauſe this water, being clear, renders the colour of the hemp brighter than it would otherwiſe be, as there is not any filth therein to ſully it: and it peels the more eaſily when ſo ſteeped, not being there liable to ſo great a degree of putrefaction, as to break the cohesion of the fibres of its bark. It is not, however, here meant, that the hemp ſhould be ſteeped in the bed of the river, becauſe the inequality of the motion of the water on the ſides, and in the middle of the hemp, would prevent the ariſing of that equal degree of putrefaction which is in this caſe eſſentially neceſſary. On the ſide of ſuch rivers, a hollow ſhould be dug three or four feet deep, and proportioned in extent to the quantity of hemp to be watered.

As it is contrary to law that the places for ſteeping hemp be made in running water, it would be of advantage to contrive them ſo that the waſte water from the ſteeping places ſhould run off upon paſture-grounds; becauſe the quantity of putrid vegetable matter which the water wherein hemp has been ſteeped carries along with it, would greatly enrich thoſe grounds; and with this view likewiſe all the water of pools or other places uſed for the ſteeping of hemp, ſhould be thrown out of them upon the graſs, as ſoon as the hemp has been removed.

It is eſſential to take heed, that the hemp be not, by any means, laid to ſteep in water in which there are any animals that might be apt to gnaw it; for theſe would cut aſunder, and totally deſtroy its fibres. Of this kind are, in particular, thoſe creatures which ſome people call freſh-water ſhrimps.

The common method of judging when the hemp has been ſufficiently ſteeped, is by trying whether the bark parts eaſily from the reed, and can be peeled off its whole length without breaking; for in this caſe it is thought to have been watered enough. However, it muſt alſo be allowed, that long practice enables the peaſants who cultivate hemp to give it, generally, a due degree of ſteeping, though they do ſometimes miſtake: and it is alſo to be obſerved, that it is the conſtant cuſtom of ſome countries to ſteep their hemp more than others. But the ſureſt way of all to diſtinguiſh whether the hemp has been ſteeped enough, is, as the Tours Memoirs remark, to take ſome of the ſtems out of the water, and then to try whether the extremity of the roots ſnaps off ſhort, and whether the bark ſeparates clear from the reed, its whole length; for in theſe caſes it is certain that the hemp has been ſufficiently watered, and it ſhould then be immediately taken out. If the bark does not ſeparate equally, but ſtops chiefly at the ſmall knots which appear on the ſtem, this ſhews that it has not been ſteeped enough.

The uſual duration of the ſteeping of the male hemp is from three to ſix days, according to the weather; and of the female hemp, from five to eight or ten days: but as only a ſmall degree of too much or too little ſteeping is equally hurtful, the utmoſt attention ſhould be exerted to hit the preciſe time of its being duly watered.

Some injudiciouſly neglect to waſh their hemp when it is taken out of the water, becauſe, ſay they, the filth brought out of the water with it will afterwards fall off: but, in the drying of the hemp, this filth gives it a bad colour, and the duſt which ariſes therefrom is extremely prejudicial to the health of the workmen.

When the hemp, after having been properly ſteeped, is taken out of the water, the bundles of it ſhould be untied, and ſpread upon ſand, or upon ſtrong rocky ground; or, if neither of theſe be at hand, it may be laid upon a field that has been lately reaped, and where the ſtubble ſtill remains ſtanding. This ſtubble will keep it hollow, and it will dry the ſooner. Some dry their hemp by ſpreading it out and ſetting it upright againſt a ſunny wall, or by laying it along the ſide of a ditch. Graſs is not fit for laying it on, becauſe there will ariſe from thence a moiſture which will rot the hemp. For this reaſon it is, that the place where hemp is ſpread to dry, ſhould be as free as poſſible from every kind of damp. When the hemp is thoroughly dry, it is bundled up again, and carried home, where it ſhould be kept in a very dry place till it is wanted for peeling or breaking.

The method of peeling hemp is ſo ſimple, that a deſcription of it would be needleſs: even children, and the aged and infirm may perform it with eaſe, by only taking one ſtalk after another, breaking the reed, and ſlipping off the bark. This may likewiſe become the employment of every perſon belonging to the farm in winter evenings, and at ſuch times as the weather will not admit of their working without doors. It muſt however be allowed, that there are ſome inconveniencies attending this method: the peeled hemp comes off in ribbands, which do not anſwer in the hackling ſo well as that which has been broken; more of the uſeleſs membranes, eſpecially towards the root, ſtill adhere to it, and, by increaſing its weight, render it, to uſe the common ſaying on this occaſion, better for the ſeller than for the buyer; beſides which, the hemp does not always peel off in equal lengths, and from thence ariſe conſiderable diſadvantages, and loſs in its future dreſſings.

The hemp which is to be broken ſhould firſt be rendered very dry; becauſe the reed will then be more brittle, and therefore part the more eaſily from the bark. There are ſeveral ways of drying it. Meſſieurs Du Hamel and Marcandier deſcribe a kind of cave or cavern, in which it is commonly dried in many parts of France. This cavern is generally ſix or ſeven feet high, five or ſix feet wide, and nine or ten feet long. A hollow under a rock is often properly made uſe of for this purpoſe: but as that cannot always be met with, it frequently is neceſſary to have recourſe to art. In this caſe, ſome form the top of their vault with dry ſtones, others cover it with broad flat ſtones, and others again only cloſe it with pieces of wood, over which they lay a quantity of earth ſufficient to ſtop up all the interſtices: but which ever of theſe methods is taken, the drying place ſhould be ſo ſituated as to be ſheltered from the north and north-eaſt winds, and be open to the ſouth, that it may receive the benefit of the ſun; becauſe the uſual ſeaſon for breaking of hemp is in clear froſty weather, when the buſineſs of the field is ſuſpended.

At about four feet above the floor of this drying place, and two feet from its mouth or entrance, three bars of wood, about an inch thick are placed acroſs the cavern, from ſide to ſide, and there fixed. On theſe bars is laid, about ſix inches thick, the hemp that is to be dried. A careful perſon, which generally is a woman, then keeps conſtantly burning, under the hemp ſo laid, a ſmall fire made of fragments of the reeds of hemp that has already been broken or peeled. The perſon thus employed muſt be extremely watchful, becauſe, as this kind of fuel is ſoon conſumed, and muſt of courſe be frequently repleniſhed in order to keep a conſtant and regular fire all over the hearth (for this is abſolutely neceſſary) very great care muſt be taken that the flame do not ever riſe ſo high as to ſet fire to the hemp, which is exceedingly combuſtible, eſpecially after it has been dried ſome time. The ſame perſon alſo takes care to turn the hemp from time to time, in order that it may be dried equally in all its parts; and likewiſe to put on freſh hemp, when the former is dry enough to be taken away and ſent to the break.

Where but a ſmall quantity of hemp is to be dried, an oven is doubtleſs the ſafeſt method; and when the hemp is dreſſed at home, it may perhaps be dried as faſt by this means, as the other avocations of the family will admit of its being wanted. The only attention requiſite in this caſe, is that the oven be not ſo hot as to endanger the fine and tender fibres of the hemp: for too great a heat may not only ſcorch them, but likewiſe ſo parch the oil in the hemp, as that the hemp will afterwards remain harſh and dry, and not be ſo eaſily whitened as it might otherwiſe be.

It alſo is uſual, where the quantity of hemp is greater than can be managed with an oven, to dry it on a kiln; and this is a good method; provided the fire here be alſo very moderate, and made of ſuch materials as do not blaze or ſparkle, becauſe of the great aptneſs of dry hemp eaſily to take fire. Coke is perhaps the very beſt fuel that can be uſed for this purpoſe.

The operation of breaking hemp, by which general term is however ſtrictly meant only the breaking of the reed, which ſome call the bunn, or woody part of the ſtem, within the bark; for the bark itſelf, of which is made the filamentous ſubſtance that is ſpun and uſed in manufactures, only bends under the hand of the dreſſer, and does not break; this operation, I ſay, has hitherto generally been executed three ways, namely, by beating the hemp with beetles, which is a laborious and tedious work; or by the Dutch hand-break, which is in every reſpect much preferable to the beetle; or by fluted rollers worked by horſes, wind, or water, but of choice by the latter, where a running ſtream can be procured. This laſt is more expeditious, and leſs laborious than either of the other ways; but is dangerous to the workmen employed therein, becauſe, if by any inadvertence the rollers ſhould catch hold of their fingers, the loſs of a limb at leaſt is inevitable. The only means of preventing this dreadful conſequence, in ſuch a caſe, is to have an iron crow at hand, ready to clap inſtantly between the rollers, as is practiſed in ſugar-works, which are of a ſimilar conſtruction.

The fluted rollers are undoubtedly the beſt inſtrument for breaking hemp, becauſe the length of the ſtalk and ſtrength of the reed of this plant muſt render the Dutch-break a very tedious operation, eſpecially when large quantities of hemp are raiſed, as muſt be the caſe wherever a ſufficiency of it is cultivated to anſwer the purpoſes of the great and important manufactures in which it is employed in this nation.

The Moravian hemp mill, uſed in America, is alſo a good inſtrument. It conſiſts of a large heavy ſtone, ſhaped like a ſugar loaf, with the ſmall end cut off. A body of that form will go round in a circle, if it be moved on a plane. This is moved by a water mill, and the hemp, being laid on the floor, in its way, is bruiſed by the weight of the ſtone paſſing over it.

After the hemp has been broken, it undergoes a ſecond operation, which is commonly termed ſwingling or ſcutching. The intention here is, to ſeparate the reed from the hemp, and this is done by one or other of the following ways. In the firſt, the workman takes a handful of hemp in his left hand, and, holding it over the edge of a board, ſtrikes it with the ſharpened edge of a long, flat, and ſtrait piece of wood, commonly called a ſwingle hand, or ſcutcher. The author of the thirty-ſeventh letter in the Dublin Society's Weekly Obſervations recommends that the cutting edge of the ſcutcher be made of a circular form, in order that its greateſt force may fall on the middle of the hemp, and thereby ſpread it, by which means it will be the more equally cleared of the remaining broken pieces of the reed. But this method is, at all events, very laborious and tedious; and therefore water mills have been erected, in which ſeveral ſcutches, fixed in the ſame axle-tree, are moved with great velocity. Here the work is performed with great expedition, and much leſs fatigue to the workmen; but a greater waſte is made of the hemp, owing to the velocity with which this engine is turned.

Before the hemp thus prepared is heckled, it uſually undergoes a third operation, called beetling, the deſign of which is to looſen and thereby more thoroughly ſeparate its fibres. The beetles uſed for this purpoſe are moved either by hand or by water.

We have already deſcribed the inſtruments invented by Mr. Macpherſon for performing theſe operations with very great facility, under the article flax, and therefore need not be repeated here. See the article FLAX.

Mr. Marcandier propoſes, inſtead of ſcutching and beetling the hemp, to give it a ſecond ſteeping after it has been peeled or broken, the better to ſoften the bark that may ſtill remain hard, and not be eaſily brought to a proper degree of fineneſs. For this purpoſe, the hemp intended to be ſteeped a ſecond time is divided into ſmall parcels: theſe are tied looſely round the middle with a piece of packthread, in order that they may be managed eaſily without mixing or entangling them; and the hemp thus tied is laid in a veſſel filled with water, where it is left, more or leſs time, according to the hardneſs of its fibres and the quantity of glutinous adherent matter ſtill remaining on it. Three or four days are always ſufficient for this purpoſe: but a leſs time will do, if the hemp wants only to be cleared of that adherent matter. When it has been thus ſteeped long enough, it ſhould be waſhed very clean in a running ſtream; and if many of the fibres of the hemp are found to cling together in what our author calls ribbands, he adviſes to beat them in the manner that linen is beaten in bleaching.—It is ſafer to err in too little, than in too much ſteeping; becauſe, after the fibres have been looſened in the break, they will be the more liable to be deſtroyed by even only a ſlight degree of putrefaction. When the fibres of the hemp are ſufficiently diſengaged from each other, they ſeem, while immerſed in water, to be as completely dreſſed as if they had already paſſed through the hackle. After this watering, the parcels are opened, ſpread on a board, and laid in the ſun to dry.

M. Marcandier obſerves farther, and likewiſe from his own experience, that, after this preparation, the hemp may be again ſteeped and waſhed in a leye of pot-aſh or wood aſhes, rendered perfectly clear of all filth. This will undoubtedly contribute to the removing of any ſuch matter ſtill remaining in the hemp, as muſt neceſſarily fall off in the future preparations, before the manufacture made of the hemp is fit for uſe. And, indeed, a leye of this kind bids fair to be of ſervice in the preparing of flax as well as hemp; becauſe, both being thereby perfectly freed from every particle which muſt otherwiſe fall off in the future operations of hackling, ſpinning, bleaching, &c. the cloth or other manufacture made of them will be proportionably better and more durable. The time taken up in bleaching will, in particular, be very much ſhortened thereby.

In the whole of this proceſs, the water ſhould be warm, becauſe warm water acts more powerfully than cold in diſſolving the impurities which are to be ſeparated from the hemp; and it is alſo an indulgence to the people employed in this buſineſs, who might otherwiſe be more apt to ſlur over their work. It will therefore be moſt adviſable to perform this operation when the weather is moderately warm, thereby to ſave the trouble and expence of making fire to warm the water or the leye.

M. Marcandier having experienced the efficacy of horſe-cheſnuts in the bleaching of linen and cleanſing of woollen ſtuffs, made likewiſe uſe of a ſolution of them in water, as a leye for preparing hemp in the manner above deſcribed. The method of preparing this leye is as follows: the cheſnuts are peeled, and then raſped as fine as poſſible into ſoft water, in the proportion of two, or, at moſt, three nuts to every quart of water. This is done ten or twelve hours before the mixture is to be used, and in the mean while it is stirred from time to time, the better to dissolve these raspings and impregnate the water. The last stirring is given a quarter of an hour at farthest before the water is drawn off from the coarser part of the raspings, which sinks to the bottom; and this is done, either by inclining the vessel and pouring the leye off gently into another, or by lading it out by hand, while the water is yet white, and froths like soap-suds. In order to use this leye, it is made rather hotter than the hand can well bear, and the hemp is then steeped and washed in it, as in soap-suds.

The hemp thus prepared is carefully dried, laying the fibres smooth and as little intermixed as possible. When dry, it is doubled, and twisted at the ends, or tied up in bundles. The farther business of the hemp-dresser need only be an easy beating of the hemp, and that chiefly to separate the fibres that may have clung together in the drying, and to the common operations of the heckle. The danger so often fatal to the dressers of hemp, from the dust drawn in with their breath, will also be hereby in a great measure avoided; and the hemp thus prepared will be white, smooth, soft, and flexible.

The same author extols highly the various uses to which hemp thus prepared, and even its tow, or what is separated from it by the heckle, may be applied. This hemp, he informs us, may be dyed like silk, wool, or cotton, and may be made into cloth, stuffs, and garments of all kind; and that a great advantage attending the use of this material is, that it will not be in danger of being destroyed by those worms which eat woollen cloth. These advantages attending hemp prepared in the manner which Mr. Marcandier has proposed, may well deserve the farther experiments and attention of our manufactures, especially at Manchester, or wherever else our mixed stuffs are made.

Having now described the manner of cultivating hemp, and the several methods by which it is prepared for the manufacturer; we shall close this article with M. Du Hamel's following directions how to judge of the quality of the hemp that has been dressed, and is intended for manufacturing.

It is of importance that the hemp in bales, for so it is always packed, be not damp; because it would then weigh heavier than it ought, and would be apt to contract a heat, which might end in rottenness. The hemp in each head, or bundle, should be as nearly as possible of equal length, and diminish gradually from the root end to the point. That which has been broken is softer, and its fibres are more separated, than that which has been peeled. From hence it would seem as if this hemp might be worked up with less loss of substance than peeled hemp; but yet, in fact, it generally yields the greatest quantity of refuse, not only because it is never so well cleared from the reed, but also because its fibres being mixed and intangled with each other, a greater number of these are broken when it is heckled. It is, however, on the whole, most probable, that breaking may be the best way of dressing very hard and strong hemp, because the break certainly contributes greatly to render it soft and fine.

Too great a stress is sometimes laid on the colour of hemp: that which is of a silver or pearl colour is reckoned the best, that which has a greenish hue is likewise deemed good, that which has a yellowish cast is less esteemed, and the dark colour only is rejected: but at the same time it should be observed, that the colour of hemp depends chiefly on the sort of water in which it has been steeped, that being dark which has been steeped in standing water, and that light coloured which has been steeped in running water; and therefore, that the colour of the hemp does not in fact deserve very great attention, unless it be black, or of a very dark brown. In these cases, indeed, it may be presumed, that the hemp has either been steeped too much, or that it was packed up so moist as to have been heated in the bale. The smell of the hemp is more to be relied on than its colour; and in consequence thereof, that which has a rotten, mouldy, or heated scent, should be absolutely rejected, whilst that which savours strong of only the natural smell of hemp should be preferred, because this indicates it to be of the growth of the last crop; a circumstance which is much attended to in the rope-yards, because new hemp is found to waste much less in the working than old, though it is at the same time true, that it does not heckle so fine.

In general, it may be laid down as a rule, that the hemp which feels softest, and whose fibres are the finest and most equally separated, is the best.

M. Du Hamel, who has long exercised with distinguished honour, perfect disinterestedness, and judgment equal to his high and well deserved fame, the important office of inspector general of the marine of France, tells us, that the common way of examining the hemp there, in order to judge of its strength and fitness for naval uses, is, to take here and there a little of it out of each bale that is delivered into the royal stores, and to try whether, when a few of its fibres are put together, they break easily, or with difficulty, between one's hands. If they resist much, the hemp is judged to be good; and if, on the contrary, they break easily, it is deemed bad. But this he thinks an erroneous way of judging of its quality, because the fibres of coarse and hard hemp are often strong enough to bear this trial; and yet, as appears from numbers of experiments which he made with admirably nice understanding and precision, the ropes made of that hemp never are near so strong, and consequently not near so serviceable as those made of fine, soft, and supple hemp, the fibres of which might be broken with less force than the former. If, to this fineness, suppleness, softness, and silky feel of the hemp, strength of fibres be added, such hemp is perfect, and the works made of it will be least bulky, and at the same time by far the strongest and most durable. For this reason in particular it is, that the male or karl hemp is always preferred to the female or fimble hemp, especially when this last has been let stand longer than the other, to ripen its seeds, in consequence whereof it become harder and more woody, and does not yield so fine fibres; nor does it, therefore, bear so great a price. The female hemp is generally browner than the male; this last being of a brighter and more silvery colour: but however, if, upon the whole, there be not a greater quantity of female hemp in a bale, than there is of male, M. Du Hamel thinks it need not be complained of.

Two farther, and those very essential, circumstances which the buyer should notice in his choice of hemp, are, first, to examine whether any of the reed be left, and whether it adheres strongly to the hemp; for if it does, this is a sign that the hemp has not been steeped enough: and, secondly, if it be free from all remains of the reed, to examine attentively its upper end, or point; for this will break too easily if it has been steeped too much, otherwise it will retain a proper degree of strength.

The store-rooms for keeping hemp should be raised so high from the ground, as to be very dry; and they should also be well aired. Great care should be taken that the hemp be thoroughly dry before it is piled up in them, and spaces should be left between the piles, for the circulation of fresh air whenever this is requisite. The hemp should also be sorted when it is piled, in such manner as to put together in the same heap, as nearly as possible, that which is of equal length, and of a similar quality.

The owner of these stores should examine them carefully from time to time, by thrusting his arm as far as he can into the piles, in order to judge whether the hemp heats; for if it does, the pile or heap should be immediately taken down, and the bundles should be untied, aired, and afterwards removed into other places.

Rats and mice must be guarded against with all possible caution; for they are extremely fond of forming their nests in hemp, in doing of which they gnaw asunder such quantities, as thereby to occasion very great loss and damage.

HEPS, the fruit of the species of wild rose, generally written hips.

HERBAGE, grass, pasture in general. It is also used to signify the tythe and right of pasture.

HERD, a number of beasts together, generally black cattle.

HERDSMAN, a keeper of herds, one employed in tending cattle.

HIDE, the skin of beasts, but particularly applied to those of large cattle, as bullocks, cows, horses, &c.

HIDE *of Land*, was such a quantity of land as might be ploughed with one plough within the compass of a year, or so much as would maintain a family; some call it sixty, some eighty, and some an hundred acres.

The distribution of this kingdom by hides of land is very ancient, mention being made of it in the laws of king Ina. Henry I. had three shillings for every hide of land, in order to raise a dowry for his daughter: this tax was called hidage.

HIDE-BOUND, a distemper in horses, when the skin sticks so fast to the back and ribs, that the hand cannot separate the one from the other, without great difficulty; his body is at the same time lean, his back-bones stand up, his guts are for the most part deficient in moisture, and his dung dry, and more offensive than common.

If a horse become hide-bound by hard riding and ill keeping, he may be cured by good keeping. If it be the effect of a fever, or some other disease, if that be cured which is the cause, the effect will cease; but if he has no fever upon him, and he is hide-bound only from lowness of blood and spirits, give him boiled barley, white-water, or the like, and when his flesh is raised, harden it with good oats, beans, and moderate exercise.

HILL, an elevation of ground, less than a mountain, a down.

HILLS, are of great use in a garden; as,

1. They serve as screens to keep off the cold, and nipping blasts of the northern and eastern winds.

2. The long ridges and chains of lofty mountains, being generally found to run from east to west, serve to stop the evagation of those vapours towards the poles, without which they would all run from the hot countries, and leave them destitute of rain.

3. They condense those vapours, like alembic heads, into clouds; and so, by a kind of external distillation, give origin to springs and rivers; and, by amassing, cooling, and constipating them, turn them into rain, and by that means render the fervid regions of the torrid zone habitable.

4. They serve for the production of a great number of vegetables and minerals, which are not found in other places.

It hath been found by experiment and calculation, that hills, though they measure twice as much as the plain ground they stand upon, yet the produce of the one can be no more than the other; and therefore, in purchasing land, the hills ought not to be bought for more than their superficial measure, *i. e.* to pay no more for two acres upon the side of an hill, than for one upon the plain, if the soil be equally rich.

It is true, that those lands that are hilly and mountainous are very different, as to their valuable contents, from what are found in flat and plain ground, whether they be planted, sown, or built upon; as for example:

Suppose an hill contains four equal sides, which meet in a point at the top; yet the contents of these four sides can produce no more grain, or bear no more trees, than the plain ground on which the hill stands, or than the base of it; and yet by the measure of the sides there may be double the number of acres, rods, and poles, which they measure on the base or ground-plot.

For as long as all plants preserve their upright method of growing, hilly ground can bear no more plants in number than the plain at the base.

Again, as to building on an hill, the two sides of an hill will bear no more than the same number of houses that can stand in the line at the base.

And as to rails, or park-paling over an hill, though the measure be near double over the hill to the line at the bottom, yet both may be inclosed by the same number of pales of the same breadth. *Miller's Gard. Dict.*

HILLOCK, a little hill.

HIVING *of Bees*, the placing a swarm of bees in a hive, in order to have the benefit of their labours. *See the article* BEE.

HOE, a tool made like a cooper's adz, to cut up weeds in gardens, fields, &c. This tool is commonly called the hand-hoe.

This instrument is of great use, and should be more employed in hacking and clearing the several corners, cracks, and patches of land, in spare times of the year, which would be of no small advantage thereto.

Horse HOE, a large kind of hoe, drawn by horses, and used to stir the intervals in the New Husbandry, and clear the corn from weeds.

Under the article CULTIVATOR, we have described the instruments used abroad for this purpose; and shall here give two very useful instruments of the same kind, invented by the ingenious Mr. Hewitt, who presented them to the Society for the Encouragement of Arts, &c. where they may be seen. The following letter, describing these instruments, was sent by the inventor to the Society.

GENTLEMEN,

Perusing the Essays on Husbandry, I observed particularly, that the author, page 105, expresseth hopes of seeing some "new-invented plough, cheap, simple, and rightly calculated for destroying weeds; keeping plants clean; and stirring the ground:" and, page 106, further says, "now as most people prefer useful, and cheap, to elegant and expensive inventions, it is natural to wish for a hoe-plough intirely simple, and not costly. For the mechanism of those devised hitherto, by the ingenious lovers of agriculture, is of so perplexed, and complicate a nature, that it will no ways answer the common purposes of husbandry: but, being perpetually out of order, will throw the poor ploughman into despondency; and the rather, as neither he, nor the country plough-wright, can comprehend how to rectify any defects, or accidents, except with extreme difficulty."

The very name of a hoe-plough suggested the idea of an instrument, which I shall call a horse-hoe; whose construction is intirely new, simple, and much less costly than a common plough. Such as country plough-wrights, and smiths, are able to make; and such as common ploughmen are able to use: and which seems, according to the hopes of the aforesaid author, to be rightly calculated for destroying weeds; keeping plants clean; and stirring the ground.

This horse-hoe, a model of which I beg leave, in the most respectful manner, to present to this honourable Society, I hope may be of a very extensive use in agriculture, as it must be much more efficacious, and expeditious too, than any kind of hand-hoe for the destruction of weeds, and stirring the ground. For if the instrument does not cut below the crown, or head, of the roots, such roots will sprout again, and the first labour become fruitless; which indeed is too often the case of hand-hoeing: as the labourer, sometimes, only scratches the surface of the earth, and shaves off the leaves of the weeds, the roots remaining intire and unhurt, to vegetate again. With this instrument, the husbandman may hoe the ground so deep, that it will infallibly cut asunder the roots of every weed it meets with, below the crown or head; and, consequently, either destroy them, or at least greatly check their future growth that season.

This instrument is calculated for hoeing the intervals between the generality of plants in straight rows: such as transplanted lucerne, beans, pease, and turnips, sown with a drill-plough, &c. In large gardens, hop-grounds, nurseries, and plantations of young trees, much labour, and expence, in hand-hoeing, may probably be saved by the use of it.

In the county of Norfolk (and probably in many other places) the husbandmen, in the months of March and April, preparing their lands for barley, generally give them a certain number of earths, according to the phrase of that country; or, in other words, plough them a certain number of times. In those months the weather is frequently very dry; and the soil being turned over and over again, and exposed to the sun and wind, becomes so dusty, that a great part of the seed will not grow without rain; which, sometimes not falling in many weeks after the seed-time, causeth the crop to consist of different growths: so that when the first grown crop is ripe for the scythe, the latter is but just eared. This evil, perhaps, may, in some measure, be remedied by the use of this horse-hoe, instead of the common plough, at that season. For this will stir, and loosen, the earth as effectually, as the

The Common Horse Hoe
on Plate 26 Fig A

the other; and, at the same time, neither remove, nor turn it over, which seems to be beneficial, in a drought, upon very light and sandy soils.

With respect to foul summer fallows too, it may be of singular service. The common plough buries the weeds, of which many grow again. This horse-hoe will cut their roots asunder, below the surface of the earth; and by leaving their foliage above it, exposed to the summer sun, the greatest part of them will wither and die: so that they will not give the husbandman much more trouble the remaining part of the summer. And, as this hoe may be eighteen or twenty inches broad, two acres of land may be hoed by it, as soon as one acre can be ploughed, by the common plough.

This new instrument is intended for public benefit; and to the consideration of the public, as well as of this honourable Society in particular, it is freely submitted. If it be judged an useful implement in husbandry, well; if not, the pleasure that has arisen from the hope of doing good, has amply rewarded, for his trouble, the inventor, who has the honour to subscribe himself,

Gentlemen,

Hadleigh, April 19, 1766.

Your most humble, and obedient servant,

William Hewitt.

P. S. Since I had completed this model, I apprehended, that its utility might be rendered still farther extensive, by a very small alteration; therefore, gentlemen, I take the liberty of laying before you another model, calculated for hoeing the furrows between wheat ridges, which all farmers acknowledge to be very good husbandry, though many of them are deterred from the practice of it, for want of a cheap expeditious method of putting it in execution. An instrument of this kind, I am persuaded, will very greatly expedite that useful work: and if it meets with your approbation, gentlemen, many lovers of improvement in agriculture may be induced to give it a fair and impartial trial.

An Explanation of the Horse-Hoe, *Plate* XVII. *Fig.* 3.

A represents a small round curved iron-bar, fixed upon each end of the axle of the wheel, by which the horse-hoe is drawn.

B, the wheel three feet in diameter.

C c two flat iron-bars, three feet long, fixed upon the axle of the wheel, at D d, and to the sides of the hoe; at E e, by bolts and screws: upon these bolts, as well as the axle of the wheel, they are moveable.

F a small round iron-bar, fastened at each end, into the two bars; C c (to strengthen them) at G g, from and to G; these bars may be straight. From G to E, let them be curved.

H, the hoe itself; the breadth of which may vary according to the different distances of the rows of plants, whose intervals are to be hoed.

KK, two little flat curved iron-bars, fixed by bolts, upon which they are moveable, to the bars C c. Each of them pass through a staple, fixed into the sides of the hoe at L l. In both these little bars is a row of holes. In each of the staples, is one hole; and, directly opposite to them, one hole in each of the sides of the hoe: and, by means of two bolts, passing through these holes, and some of the holes in the bars K K, the hoe is fixed to any position; so that the ground may be hoed as near the surface, or as far below it, as is necessary.

M M, two wooden handles, fixed to the two sides of the hoe, and to each other, by the cross bar O; as long, and as high from the ground, as the handles of a common plough.

Figure 4. represents the horse-hoe, intended for hoeing the furrows, between wheat ridges: which differs only, in one respect from the other. That hoe is flat; this is curved. The breadth, and curvature of this, must depend intirely upon the breadth, and curvature of the furrows, to be hoed. In which respect, every sensible farmer can easily direct the smith how to form it. But, after all, if any persons be inclined to make trial of this instrument, I would advise them not to trust to a verbal description, but to send for a model of it to Thomas Tillett, a very ingenious smith at Hadleigh in Suffolk.

HOEING, the breaking or dividing the soil by tillage, while the corn or other plants are growing thereon.

It differs from common tillage, which is always performed before the corn or plants are sown or planted, or in the time of performing it; and it is much more beneficial to the crops than any other tillage. This sort of tillage is performed various ways, and by means of different instruments. Land which, before the tillage, would have yielded little, though the more it is tilled before sowing, the more plenty of corn it yields, yet, if tilled only before the sowing, will always have some weeds, and they will partake of the advantage of the tillage as well as the corn. This is one reason for an after tillage, such as that by hoeing. But there is another consideration that yet more requires it; this is, that as soon as the ploughman has done his business, by ploughing and hoeing the land, after sowing, the soil, of its own accord, begins to undo it all again by tending towards its original texture and specific gravity again; the altering of which was the only business of all the former tillage. The breaking the particles of the earth, and making in it new pores, and new particles, or new superficies, is the great business of the plough and harrow; but, as soon as their use is over, the earth begins to coalesce again into its own form, the particles unite together, and the artificial pores in a great measure close up. The seed is nourished in a worse ground than it was first put into, and the more the plant grows up, and requires a larger supply of food, the worse the pasture becomes. While nourishment is thus denied the growing plants, they are at the same time choaked with weeds, which being of a hardier nature than they, will grow with less supplies, and therefore thrive more vigorously, and rob them of a great part of the little food the land before allowed them.

Farmers in all ages have been acquainted, in some degree, with the use of tillage and dung to crops of useful plants; but they have so ill managed the time of giving these assistances to nature, that there is no doubt but one third part of the nourishment raised by dung and tillage, if it were given to plants and corn at many proper seasons, and proportioned to the different times of their exigencies, would be of more benefit to the crop than the whole is, when applied all together at the time of sowing.

Nature, by what she does in the animal œconomy, seems to point out to us something like the remedying this by hoeing; for when the teeth, as the plough, have tilled that soil or mass which is earth altered; and when the saliva and the juices of the stomach have served to divide and attenuate it, as the salts of dung and other manure do land; after all this, the bile and pancreatic juices are ordained to farther attenuate it, at the very time when it is ready to be exhausted by the numerous mouths of the lacteals, situate in the intestines. This last operation of these juices seems analogous to the meliorating the soil by hoeing, after the plants are grown, and are becoming fit for use.

Transplanting is nearly allied in its nature to hoeing, but it is much inferior. The nature of this will not admit of its being a general thing; and even if it would, hoeing is better: for by transplanting, the plants can only be kept up to a certain period, after which they will not bear it; but hoeing may be used to them with advantage, to their utmost standing, and make them vigorous all the while.

The roots of a plant are all necessarily broken off in transplanting, and it requires some time for it to strike a whole set of new ones; and if the earth about it is not kept thoroughly moistened all this time, the new formed roots will not be able to shoot, and the plant will starve in the midst of plenty: but, on the contrary, in hoeing, the same advantage of a new pasture for the plant is obtained, by the breaking the particles of the earth, and at the same time no more of the roots are broken off than can easily be supplied, and the rest remaining in their places, the plant continues growing without that stop or decay, which must happen on transplanting, and which it recovers only by degrees. It is observed, that some plants are the worse for transplanting: lucerne and saintfoin are never so good after transplanting, as when they are left in their native places, at the fame diftances; and finochia, removed, is never fo good and tender as when it is not.

This laft plant receives fuch a check from tranfplanting in its infancy, that it has afterwards a difeafe like the rickets, which caufes knots and fwellings in it, that fpoil it as a delicacy. All the tap-rooted plants fuffer by tranfplanting; for it is neceffary in this to cut off the long-main root, which afterwards, however good the foil may be, never arrives at the length it otherwife would have had, and which was neceffary for the fuccefs of the plant.

One great benefit of hoeing is, that it keeps plants moift in dry weather, the advantage of which to their growth is eafily feen. This good office it performs on a double account. Firft, as they are better nourifhed by hoeing, they require lefs moifture, and confequently carry off lefs; for thofe plants which receive the greateft increafe, having moft terreftrial nourifhment, carry off the leaft water, in proportion to their augment, as is proved by Woodward's experiments. Thus barley or oats, being fown on a piece of ground well divided by tillage and dung, will come up and grow well without rains, when the fame grains fown on another part of the fame land, not thus dunged or tilled, will fcarce come up at all without rains, or if they do, will wait wholly for the rains for their growth and increafe.

The hoe alfo, particularly the horfe-hoe, for the other does not go deep enough, procures moifture for the roots from the dews which fall moft in dry weather; and thefe dews feem to be the moft enriching of all moifture, as it contains in it a fine black earth, which will fubfide from it in ftanding, and which feems fine enough to be the proper pabulum, or food for plants.

A demonftration that the tilled earth receives an advantage from thefe dews, which the untilled does not, is this; dig a hole in any piece of land, of fuch a depth as the plough ufually goes to; fill this with powdered earth, and, after a day or two, examine the place, and the bottom part of this earth, and bottom of the hole, will be found moift, while all the reft of the ground, at the fame depth, is dry. Or, if a field be tilled in lands, and one land be made fine by frequent deep ploughings, while another is left rough by infufficient tillage, and the whole field be then ploughed acrofs in dry weather, which has continued long, every fine land will be turned up moift, and every rough land as dry as powder from top to bottom.

Although hard ground, when thoroughly foaked with rain, will continue wet longer than fine tilled land adjoining to it, yet, this water ferves rather to chill than to nourifh the plants ftanding in it, and to keep out the other benefits of the atmofphere; it leaves the ground much harder alfo than before, when it is finally exhaled out of it; and when, at length, the earth is then hardened, it can receive no benefit from any thing lefs than a deluge of rain, which feldom falls till the feafon of vegetation is over.

As fine hoed ground is not fo long foaked with rain, fo the dews never fuffer it to become perfectly dry. This appears from the flourifhing ftate of plants in hoed ground, while others near them, but in ground not hoed, are ftarved for want of nourifhment. The common opinion is againft this, but obfervation proves it to be true againft the common opinion. The vulgar are guided by this, however, and will not hoe their ground in dry weather for fear of letting in the drought, as they call it; whereas hoeing this is the only method of keeping away the drought, and without either this, or watering, they muft perifh in thefe feafons. *Tull's Horfe-Hoeing Hufbandry.*

HOG, the name of an animal too well known to need any defcription here.

Thefe creatures are very advantageous to the countryman, not only for their great increafe, but alfo becaufe they feed upon what would otherwife be of no ufe or advantage, but would be thrown away; as whey, wafhings of tubs, grounds of drinks, difh-water, grains, &c. and their flefh being beft falted, or kept in pickle, may be eat in the fpring, when other meat is at the deareft; befides the help it affords to the taking off the produce of the garden, and the variety of difhes of the offal. Swine are indeed very greedy, and very apt to root up ground, and break the fences; and therefore the greater care muft be taken to keep them both well rung and well yoked.

The largeft fwine, and the greateft number for any particular places, are bred in Leicefterfhire, and fome parts of Northamptonfhire, and in the clayey countries adjacent; probably from the large quantities of beans and peafe fown in thofe parts.

The wild kind are not fo large as thofe juft mentioned, but are much more hardy, and better meat.

In the choice of hogs, chufe fuch to breed out of as have long, large bodies, are deep fided and bellied, that have a fhort nofe, thick thighs, fhort legs, high claws, thick neck, a fhort ftrong groin, and a thick chine, well fet with ftrong briftles.

To have too many fows in one yard is not good, for their increafe is fo great, that they will, for want of food, not only devour whatever comes in their way, but eat one another: for a fow will bring forth pigs three times in a year, that is, at the end of every fixteen weeks. It is common for them to have thirteen or fourteen pigs at a litter; but the fow can rear no more than fhe has teats to fuckle them with; the reft muft therefore be deftroyed, or put to other fows. If the fow mifs the time of going to boar, that fhe might in courfe have done, give her fome oats parched in a pan, in her wafh, or the fmall end of a runnet bag, and it will caufe her quickly to go to boar. The pigs which you rear, after you have chofen out the beft for boars and fows, the males muft be gelt, and the fows fpayed; the fpayed gelts, as the farmers call them, are efteemed the moft profitable, becaufe they have a much larger quantity of fat upon their inwards, than other hogs. Young fhoots, which are fwine of about three quarters of a year old, are beft for pork, and thofe of a year, or a year and a half, for bacon. The beft age for a fow to bring forth pigs, is from one to feven years old; and the beft age for the boar, is from two to five years old, at which time it is beft to geld him, or fell him for brawn; the beft pigs to rear, are thofe which are pigged in the fpring, and thofe pigged in March for pork in October.

The beft way of taking care of fwine, is to feed them fo as to keep them in middling plight, till you defign to fat them; for if you keep them too fat, it will endanger their health; and too lean will render them too ravenous. It is good to give them fuch fwill as you have every morning and evening, to make them come home to their ftyes. The reft of the day, let them graze, and get fuch food as they can; but when the corn is upon the ground, you muft be careful to keep them within bounds. Moift fedgy grounds are good for them, the roots of which they will eat; and all forts of haws, heps, floes, crabs, acorns, maft, chefnuts, &c. with which, if you have plenty enough to fat them, their flefh will eat much better and fweeter than if fatted in a ftye. Some, indeed fay, their fat will not be fo folid, nor fo profitable, and therefore they commonly fhut them up for a week or ten days, and feed them with dry peas; but this is a miftake, experience having fhown, that hogs fatted with acorns only have their fat as folid as thofe fatted with peas. In fatting hogs in ftyes, they obferve to give them meat often, and but little at a time, that it may be always frefh; and likewife to give them as much water as they will drink, and to keep them very clean, which will help their fatting, and improve the tafte of their flefh. But where the hufbandman lives remote from woods, or the year fhould fail of producing acorns or mafts, they commonly fat them wholly in ftyes with peas, if cheap; if dear, the meal of barley, rye, or offal corn, according as they are cheapeft, which they mix with water, whey, or fkimmed milk: with thefe they feed them till fat, which will commonly be in about a month's time, and then they feed them with peas a little before they kill them.

Obferve, that every ftye have a yard well paved with ftone, if poffible, for the hog to go out and eafe and air himfelf, that he may keep his lodging the cleaner.

In Liecefterfhire they have a very eafy method of fattening great numbers of fwine, which they do by ftacking up their peas and beans in the form of a fmall cottage. This they fet near fome running brook, and hedge a yard in round about it, taking fome part of the ftream into the yard for the hogs to drink at; into this yard they turn fuch a number of hogs as they think their peas or beans

will

will fat, where they let them live till their provifion is confumed, cutting the rick down, and giving it to them as they can eat it. *Mortimer's Hufbandry, vol.* I. *p.* 244.

HOG-SHEEP, or *Heggrel*, a fheep of a year old.

HOLT, a wood.

HOLM, an ifland in a river; it alfo fignifies the holly.

HOOP, a meafure equal to a peck, or quarter of a bufhel.

HOP, a well known plant of the reptile kind, whofe flower is a principal ingredient in beer, and other malt-liquors.

A rich, deep, mellow, dry foil, rather inclining to fand than clay, is, in general, beft adapted to the cultivation of hops; but a black garden mould is excellent for this purpofe. Stiff clays, fpewy lands, fuch as are apt to be overflown by floods, hard gravels, ftony grounds, very fandy ones, and fuch as are not at leaft a foot and an half deep, are altogether improper for hops.

The beft fituation for hop-grounds is fuch as inclines to the fouth, or lies open to it, fo that they may have the benefit of the fun during the greateft part of the day. It muft alfo be open, for the air to have a free paffage and circulation between the plants, and it fhould be fo fheltered to the eaft, north, and weft, that neither the frofty winds in the fpring may cut off the young fprouts, nor the more ftormy ones in fummer and autumn deftroy the full-grown hops.

The ground and fituation being chofen, the next bufinefs is to prepare it for the planting. In many parts of England, when the ground is broken up for this purpofe, the plough goes firft, and men follow it with the fpades, with which they dig one fpit deep in the furrows where the plough has paffed, throw up the earth thus dug, and fo continue to plough and dig till the whole is done. Either this tillage, if it be well performed, or the deep ploughings, crofs-ploughings, and harrowings, by which careful hufbandmen prepare their land for corn, will fit this for being fown with turnip feeds in the end of July, or beginning of Auguft, and if the turnips are hoed twice, fo as to be left about eight inches afunder, they will yield a good crop, the weeds will be deftroyed, and the ground will be rendered loofe and fine. Another good ploughing after the turnips are taken off, will, with the enfuing winter mellowing, render it fit for being planted with hops in the fpring.

The beft time to begin ploughing is in October, in order that the foil may be properly prepared to receive the benefits of the winter's frofts, rains, and fnows; after which, in the beginning of fpring, it fhould be well and deeply ploughed again, and well harrowed; and after another ploughing in March, which will be of very great fervice, it fhould be harrowed fine, and laid as even as can be.

When the ground is in proper readinefs for planting, ftretch along a ftraight fide of the field, at fifteen or twenty feet diftance from the hedge, and parallel to it, a line with knots or rags tied in it, as far afunder as you defign your hills to be, and ftick in the ground a fharp-pointed ftick at every knot, as marks for the places where the hills are to be made; continue the line in this manner the whole length of the ground, and from this firft row you may mark out the reft of the field, either in fquares, chequer-wife, at the intended diftance of the hills, or in the quincunx form, where the hills of every row lie oppofite to the middle of the firft, in a triangular form.

The diftance of the hills fhould be, in fome meafure, regulated by the nature and goodnefs of the foil: but, in every cafe, they fhould be far enough afunder to admit the hoe-plough at all times without danger to the plants. If the foil be dry and fhallow, fix or feven feet will be a convenient diftance: but if it be rich, moift, and apt to bear large hops and leaves, it may be right to allow eight or nine feet between the hills.

The moft proper feafon for planting hops, is from the beginning of March to near the middle of April, at the time when they begin to fhoot. The Kentifh hufbandmen approve likewife of October: but the common forts are not to be procured then, unlefs it be from a ground that is to be dug up and deftroyed; befides which, there is fome danger of their rotting in the earth, if the winter fhould prove very wet.

There are feveral forts, though the botanifts allow but one fpecies of hops. The moft efteemed are, the long white, the oval, and the long fquare garlic hop. Thefe differ from each other in the colour and fhape of their bells, or hops, in their degree of bearing, and in their time of ripening. The long white is moft valued, becaufe it is a great bearer, and produces the moft beautiful hops; for the beauty of hops confifts in their being of a pale bright green colour. The oval hop is beautiful, but does not yield fo large a crop. There is a fort of this kind of white hop, called the early, or rath hop, which ripens a week or ten days before the common, and is therefore of advantage to thofe who would be firft at market: but it is tenderer than the other, and does not bear near fo plentifully. The long fquare garlic hop is the greateft bearer, more hardy, and fomewhat later ripe that the former; but by reafon of its rednefs towards the ftalk, it is not fo beautiful to the eye, and therefore is not fo much efteemed as the other forts.

Few hop grounds are without fome plants of a fort of hop which many call the female hope, but very erroneoufly; for the female hope is that which is cultivated for ufe, and this, which others name more properly the wild hop, is the male. Towards the middle of July, it puts out a great number of long loofe bunches of fmall flowers, not at all like the true hop; and in fomewhat lefs than a month after, that is to fay, juft before the true hop begins to bloffom, they ripen, and with the leaft motion of the wind, fhed a farina, which is wafted all around, and is by fome, not improbably, thought to be of ufe to impregnate other hops. Thofe who are of this opinion advife, therefore, to leave one or two hills of them ftanding in the hop-ground. But the common practice is to mark them at their firft appearance, and to root them out afterwards, becaufe they do not bear bells or hops, and as they are generally the ftrongeft plants, fets might otherwife be taken from them by miftake.

There is alfo a poor ftarved hop, called a wild hop, which is not judged to be a diftinct fort, but a hop which has degenerated for want of culture.

The planter of hops ought to be extremely careful in the choice of his plants, or fets, particularly in regard to the kind of the hop: for it is a great trouble and lofs to him, when his garden proves to be a mixture of feveral forts of hops, ripening at different times. He who plants the three forts above mentioned, viz. the early, the long white, and the fquare hop, in three diftinct parts of his ground, will have the conveniency of picking them fucceffively as they become ripe.

Hop-fets are cuttings from the roots or branches which grow from the main root or ftock. They fhould be procured, if poffible, from grounds planted with none but the fort which is defired; and they fhould be from five to feven or eight inches long, with three or more joints or buds on them, all the old bind and hollow part of the fet being cut off.

The ground being prepared for planting, as before directed, towards the latter end of February, or in the beginning of March, if the foil be light, or late in March, if it be ftrong and moift, make, in the places marked out by the fticks ftuck in them, holes about twelve or fixteen inches wide, and of a depth proportioned to the nature of the ground. In general, ten or twelve inches will be a fufficient depth. If the ground be fhallow, and you meet with hard clay or gravel, by no means enter into this, for you would then make a bafon to retain water; but, in fuch cafe, inftead of going deeper, raife up a fmall hill of good mould. If there is a good depth of rich mellow mould, dig the hole a foot and a half, or two feet deep, and you will find the hops thrive the better; for their tap roots naturally run downward.

When all things are ready for planting, fill up the holes with the mould before thrown out of them, if it be naturally good, after having firft broke it fine with a fpade: but if the fame earth be not rich enough, make ufe of fine frefh mould, or of the compoft provided for this purpofe. About a peck or two of this will be fufficient for each hill; but no new dung fhould be put into the hole on any account.

Then, with a dibble, or fetting ftick, fuch as gardeners generally ufe for planting of beans, make five or fix holes, the

the depth of your ſets, one in the middle, perpendicular, and the reſt round about, ſloping and meeting at the top near the center: put your ſets therein, ſo that they may ſtand even with the ſurface of the ground; and then preſs the mould cloſe to them, and cover them with fine mould two or three inches thick. A ſtick ſhould be placed on each ſide of the hill to ſecure it.

The ground being thus planted, all that is to be done in the following ſummer, is to keep the hills and alleys clear from weeds by frequent hoeings; to dig the ground in the month of May, and to carry off all the ſtones that are turned up by digging; to raiſe a ſmall hill about the plants; to throw ſome fine mould on their roots; and, in the latter end of May, or beginning of June, to twiſt all the vines and branches together into a bunch or looſe knot, and lay them thus twiſted on the top of the hill.

Towards the latter end of February, or in the beginning of March, in the ſecond year, when the weather is kindly, open the hills, and with a ſharp knife, cut off the ſhoots of the firſt year to within an inch of the old ſtock, together with all the younger ſuckers that have ſprung from the ſets, and cover the ſtock with fine earth. To keep the knife ſharp, you ſhould have a whetſtone always by you at dreſſing.

In the third and following years, when you dig your hop-ground in February, let the earth be taken away with a ſpade or hoe, round about the hill, very near them, that you may the more conveniently come at the ſtock to cut it: then in fair weather, towards the beginning of March, if your hops be weak, begin to dreſs them; but if they are ſtrong, and in heart, the middle or latter end of March will be the beſt time; for late dreſſing reſtrains their too early ſpringing, which is the cauſe of many injuries to the hop.

After the hops are dreſſed in the ſecond year, the next buſineſs is to pole them. Poles of only ten or twelve feet long will do then; but in the third year, by which time they come to their full bearing ſtate, they will require poles of full ſize: this, if the ground be rich, and the hop vigorous, will be from ſixteen to twenty feet, or even more; or there will be danger of loſing great part of the crop.

If the hop be weak, and the ground not rich, the poles ſhould not be more than from fourteen to eighteen feet long for fear of impoveriſhing the root; for the hop will ſoon run itſelf out of heart if over poled; ſo that, as was ſaid before, there is more danger in over poling than in under poling; neither can a good crop be expected from an over poled ground, becauſe the branches which bear the hops grow very little till the buds have over-reached the poles, which they cannot do when the pole is too long. Two ſmall poles are ſufficient for a hill in a young ground.

Towards the latter end of July hops begin to bloſſom, about the beginning of Auguſt they bell, and in forward years, they are ſometimes ripe at the end of Auguſt, or beginning of September. When they begin to change colour, or are eaſily pulled to pieces, when they emit a fragrant ſmell, and when their ſeeds begin to look brown and to grow hard, you may conclude that they are ripe: then pick them with all expedition; for a ſtorm of wind will do them great miſchief at this time; and hops picked green and bright, without bruiſing or diſcolouring, will ſell for a third part more than thoſe that are otherwiſe.

When the poles are drawn up in order to be picked, the vines around them ſhould be cut aſunder, at the height of about three or four feet from the ground; for the cutting of them lower, eſpecially while the hops are green, would occaſion ſo great a flowing of the ſap, as would weaken and hurt the root.

The moſt convenient way of picking them is into a long ſquare frame of wood, called a bin. This frame is made of two poles, or pieces of wood, each nine or ten feet long, and three or four inches broad, joined together at about a foot and a half from each end, by two other pieces three feet long; and it is ſupported by four legs three feet and a half high; ſo that there remain in the middle of it a ſpace ſix feet long, three wide, and three and a half deep. In this ſpace is fixed a coarſe linen cloth, or hop-bag, cut open on one ſide, and hung hollow, either by hitching it on tenter-hooks along the inſide of the frame, or by ſtretching it on the outſide with wooden ſkewers, to receive the hops as they are picked. Three men or women, or four boys or girls, may ſtand at each ſide of the frame, and pick two poles at a time.

When you have raiſed ſome poles, bring them with the hops and vines on them, and lay them lengthwiſe upon the frames; or erect a forked prop at each end of the frame, and reſt the poles thereon, in order to their being picked. There is no occaſion to ſtrip the vines from the poles in order to their being picked. The workmen who raiſes the poles generally carries them to the frames, and the latter being very light, may be eaſily removed from one part of the ground to another.

The ripeſt hops ſhould be firſt picked: but if the hops appear to be equally ripe in all parts of the plantation, it is beſt to begin to pick them on the eaſt or north-ſide of the ground, the more effectually to guard againſt the ſouth-weſt wind's breaking into the garden.

Having choſen a ſpot of ground which contains eleven hills, place the bin upon the hill which is in the center, and after theſe are picked, remove it into another ſpot of the ſame extent, and ſo proceed till the whole is finiſhed.

The hops ſhould be picked as free as poſſible from leaves and ſtalks; for theſe would be of greater prejudice to the ſale, than any ſeeming advantage which might be expected from their weight. The bin ſhould be emptied two or three times a day into a large cloth of coarſe linen, in which the hops ſhould be immediately ſtitched up with ſkewers, and carried directly to the oaſt, or kiln, to be dried: for if they remain long in the bin, or cloth, they will ſweat and be diſcoloured.

If any brown hops are met with in the picking, care ſhould be taken to ſeparate them from the reſt, by putting them into a baſket by themſelves.

If the weather be very hot, or rainy, cut no more hops than may be picked in an hour: but, if it be poſſible, gather them in fair weather only, and when they are dry; for this precaution will ſave ſome expence of coals, and contribute to the better preſervation of their colour when they are dried. No hops ſhould be gathered when the dew is on them, for that would make them become mouldy.

When you have taken the poles from the hills, twiſt together the remaining ends of the binds, that they may not get among people's legs, and hinder their work.

Before you draw the poles, obſerve whether the hops of one pole be entangled above with thoſe of another, and if they are, cut them aſunder with a ſharp hook fixed at the end of a long pole.

If the garden be large, it may be worth while to raiſe a ſhed in the midſt of it, to ſhelter the pickers and the hops from the ſun and rain; and to lay hops in overnight, to be picked early the next morning before the dew is off the other hops. This ſhed will alſo ſerve for preſerving your poles in winter.

If there be either rain or dew upon the hops at the time when they muſt be gathered, ſhake the pole, and they will dry the ſooner. If they are over-ripe when gathered, they will ſhed their ſeeds in which the chief ſtrength of the hop conſiſts; nor will they then look ſo green, but ſomewhat brown, which is a great diminution of their value. It therefore is better to pull the hops, a little before they are ripe, than to wait till they are full ripe. Four pounds of undried hops, thorough ripe, will make one pound of dry; and five pounds of hops ſcarcely ripe, though in their full prime, will make no more when they are dried.

There are two principal ſorts of hops, viz. the green and the brown. The former yields by much the beſt colour when dried, and the other is the moſt plentiful bearer.

Brown hops are fit for brown ale, but the hops for fine pale beer muſt be green; for which reaſon theſe laſt are moſt eſteemed.

As faſt as you pick hops, dry them on a kiln; otherwiſe they will change colour: but if you cannot dry them immediately, and muſt keep them a little while, ſpread them on a floor, and by that means the damage which they will receive in a day or two will not be great.

They who have five or ſix acres of hops, may employ ten frames at a time in picking.

If any of the rath-ripe, or early hops, which bloſſom and ripen a week or ten days ſooner than the other ſorts, happen to be intermixed in the ſame plantation, they ſhould be watched carefully, in order to their being gathered in time; for if they hang till they are over ripe, they will ſhed their ſeeds, turn brown, and thereby not only become bad themſelves, but ſpoil the ſale of the others with which they are mixed. It is therefore adviſable to mark at the bloſſoming ſeaſon, the hills in which they are, in order to dig them up and replant thoſe ſpots: for the trouble of pulling them up ſeparately, when they are ſcattered here and there in a hop-ground, and of carrying them, ſometimes a conſiderable way, to a convenient place, to be picked, is very great, and cannot be avoided otherwiſe than by either baniſhing them totally, which would not be quite conſiſtent with the huſbandman's profit, as they fetch a good price by their coming firſt to market; or, which is the beſt way, by planting them in a garden by themſelves.

Very particular care ſhould be taken that the hops be thoroughly and equally dried. In this lies the greateſt difficulty and art in the management of them: for if they are over-dried, they will change colour, look brown, and be judged to be burnt, whereby their value will be greatly diminiſhed; and if they be under-dried, they will loſe their colour and flavour. Experience has ſhewn, that an handful only of under-dried hops will ſpoil many pounds of others, by taking away their fine ſmell and colour.

The beſt way of drying them is with a charcoal fire, on a kiln covered with hair-cloth, of the ſame form and faſhion as is uſed for drying of malt, under which head this common ſort of kiln will be more particularly ſpoken of hereafter. It is found to ſuffice in places where only a few hops are raiſed, and a great deal of malt is made: but where the hop-planters have a much greater quantity of hops than can be dried in due time on their malt-kiln, (for hops, as was ſaid before, ought to be dried as ſoon as poſſible after they are picked) they build, in the following manner, ſeveral ſmall kilns on purpoſe for drying of hops.

Eight or ten acres of hop-ground require a building of about ſixty feet long, and fifteen wide in the clear. At one end of this building is a boarded room, to receive the green hops which are brought from the hop-ground, and which lie ſpread out there till there be room to put them on the kilns: at the end of the building is another large boarded room, for receiving the hops from the kiln when they are dried, and for them to lie in heaps to ſweat till they are fit for bagging. In the intermediate part of the building, three or four kilns, of eight or ten feet ſquare each, are conſtructed thus, cloſe to one another.

If the middle building is, we will ſuppoſe, twenty-eight feet long, and fifteen feet wide, there will be room for three kilns of eight feet ſquare each in the clear, and for their reſpective walls. Theſe kilns ſhould lie in a line along the back wall, and will come forward above nine feet; ſo that there will remain a paſſage five feet wide and twenty-eight feet long at the front of the kilns.

To form each kiln, build the walls of brick, nine inches thick, and let each of the four ſides be eight feet long in the clear, and ſeven feet high. The principal parts of the kiln are, in the upper part, the bed or floor whereon the hops are to be laid in order to their being dried; and in the under part, the furnace, ſteddle, or lanthorn, for the fire. The bed or floor in a kiln of eight feet ſquare, ſhould be about ſix feet from the lower floor, ſo that it it will be about a foot below the top of the wall. This foot of wall riſing above the bed, ſerves to keep in the hops on the kiln, and for men to walk upon round about the kiln, to look to the drying of the hops. The bed, or floor, may be made of wooden rails an inch ſquare, laid very even and level, into a croſs beam, a quarter of an inch aſunder: or if the kiln be arched below, the floor may be laid with long bricks, or ſtones reſting on the tops of the arches, at about two inches diſtance from each other.

In making the lower part of the kiln, place the mouth of the furnace at the bottom, in the middle of the front wall of the kiln, and let it be fourteen inches wide and ſixteen high. Joining to the mouth of the furnace on the inſide, build the ſteddle or lanthorn, of brick, four inches thick. This lanthorn ſhould be fourteen or ſixteen inches wide, three feet perpendicularly high in the ſide walls, and it ſhould reach from the front wall of the kiln to within a foot and an half of the back wall; ſo that there will be room for a man to paſs between it and the back wall, and the length of the lanthorn thus made will be about ſix feet. On its ſide walls, bricks of a foot length are to be raiſed on their ends, leaning to and bearing upon one another, ſo as to form a covering like the roof of a houſe; or the top of the lanthorn may be regularly arched over.

In building the ſide walls of the lanthorn, after you have laid the two firſt rows of brick, leave at the end of every brick in the three or four following rows, an open ſpace or hole, four or five inches wide, chequer-wiſe, both in the ſides and in the back, and lay the uppermoſt row or two of bricks cloſe together, as in the bottom rows, for the better ſupport of the roof. By this means there will be three or four rows of holes, which are deſigned to convey the heat equally to all parts under the hair-cloth. The roof ſhould be well plaiſtered on the inſide with hair and lime, that it may the better reflect the heat.

In the front-part of the kiln, on one ſide of the furnace, and at the height of two feet from the ground, a ſmall door ſhould be made, three feet high, and two wide, ſo that a man may eaſily get in to ſet every thing to rights about the ſteddle. There ſhould alſo be ſteps or ſtairs to go to the upper floor, where the hops are dried; and as there is a paſſage below, five feet wide, along the front of the kilns; ſo will there be, directly over head on the upper floor, a like paſſage, which will be of uſe for bringing the green hops from their room, and laying them on the kiln, and for carrying them to the ſtore-room after they are dried. For greater conveniency, both theſe rooms ſhould be on the ſame floor as the upper-part of the kiln.

A farther caution neceſſary to be obſerved, is that no holes be made within a foot of the fire-place or mouth of the furnace, and that all the parts about the kiln be conſtructed ſo cloſe that no wind or air may poſſibly get in. The farther end of the ſteddle ſhould be built of brick up to the top, with holes in it as in the ſides.

The kiln ſhould be ſquare, and may be ten, twelve, or fourteen feet over at the top; but there ſhould be a due proportion between the height and breadth of the kiln, and the ſize of the ſteddle where the fire is kept, viz. if the kiln be twelve feet ſquare on the top, it ſhould be nine feet high from the fire, and the ſteddle ſhould be ſix feet and an half ſquare; and ſo proportionably in other dimenſions. Theſe kilns are made at a ſmall expence.

In drying of hops, firſt lay the hair-cloth very even on the bed or floor of the kiln, and ſpread the green hops thereon, about ſix inches thick, laying them with a rake as ſmooth as poſſible, not thicker in one place than another. Let the kiln be moderately warmed before you lay on the hops; then keep an even and ſteady fire under them, but not too fierce at firſt, for fear of ſcorching them; and let not the fire ſlacken, but rather increaſe it till the hops are nearly dried, leſt the moiſture or ſweat, which the fire has raiſed, fall back and diſcolour the hops. For theſe reaſons chiefly it is, that no cool air ſhould be ſuffered to come into the kiln while the hops are drying, and that wind, which would make the fire burn too violently, ſhould not be permitted to blow on the mouth of the furnace. After the hops have lain thus about ſeven, eight, or nine hours, have left off ſweating, and leap up when beaten with a ſtick, then turn them upſide down with a broad malt-ſhovel, or ſcoop made for that purpoſe, or caſt them up into a heap in the middle, and afterwards ſpread them equally on all ſides. Let them remain in this ſituation for two or three hours more, till every hop, if poſſible, be thoroughly and equally dried; and then with a hair-cloth, remove them to the heap where they are to lie till they are bagged. If they do not dry in one place ſo much as in the reſt, which may be perceived by touching them with a ſtick or wand, and obſerving whether they rattle when ſo touched, as they will do when dry; make them thinner in the places where they rattle leaſt. They muſt not be turned while they ſweat; for that will burn them, and make them loſe their colour. The fire may be diminiſhed a little before they are turned, and refreſhed again afterwards: but thoſe times excepted, the heat ſhould be kept as equal as poſſible.

Hops are fully dried when their inner ſtalks become brittle and break ſhort on rubbing, and when their leaves fall

fall off easily, and feel very crisp. When they crackle and leap a little, as they will do upon the bursting of their seed, then is the time to take them off the kiln.

If the fuel used for this purpose be either wood or turf, it should be charred first, because smoke spoils the colour and smell of hops. Charcoal made of old rotten poles is most commonly used. Cinders of sea-coal are also very good; and it is found by experience that Kilkenny coal dries hops perfectly well, because it does not smoke, and gives a constant uniform heat for a long time. The fire should be made at the mouth only of the furnace; for the air will disperse the heat sufficiently from thence to all parts of the kiln: and that it may be constantly of the same gentle degree, neither too strong nor too weak, it may be of service to make use of a thermometer, by marking upon which the degree of heat proper for drying hops, as soon as that degree is ascertained by experiment, you may always after know how to regulate your fire with great exactness: for, putting the thermometer within-side the kiln for a short time, you may observe, by the height of the liquor, when the heat is come to a right pitch, and when it is either too high or too low, and so increase or slacken the fire accordingly. Any servant may, with the help of this instrument, be able to mend and correct the fire with great certainty, and not be liable to commit mistakes, which often prove exceedingly detrimental to the hops. When you begin drying, lose no time in the prosecution of that work, but employ people night and day, to attend it with the utmost care, till it be finished. A large malt-shovel full of charcoal, thrown into the mouth of the furnace of a kiln eight feet square, will last an hour.

It is observed that hops dried in the sun lose their richness of flavour, as other herbs do when they are dried that way. If they are laid on a floor to dry, without using a fire, they will lose their strength, be apt to sweat or ferment upon change of weather, and not be fit for packing. Fire exhales their watery parts, and, by retaining the oily, preserves their flavour and colour.

Hops break all to powder if they are bagged hot from the kiln. To prevent this, they should be laid in a heap, to sweat and grow tough; and if they are then covered for a while close with blankets, to keep the air from them, they will bag the better. There is no limited time for their sweating, that varying according to the weather: three or four days are commonly sufficient; but it is a certain rule, that when the hops feel moist and clammy, and can be squeezed in the hand, or trodden close, without breaking, they are then fit for bagging. The harder they are trodden, the better they will keep.

The bags proper for this occasion are made of coarse linen cloth. They are commonly about eleven feet long, and near two yards and a half in circumference, and contain about two hundred and an half weight of hops. The small bags, called pockets, contain about half that weight.

The manner of bagging is thus: make a round or a square hole, but a round one is most convenient, about twenty-six or thirty inches over, in the floor of the chamber where the hops are laid in heaps after they are sweated. This hole should be large enough to receive the bag, and for a man to go up and down it with ease. Tie with a piece of packthread, an handful of hops in each lower corner of the bag, to serve as handles for the more easy lifting or removing of the bag; and, with packthread, fasten the mouth of the bag to a frame, or hoop, somewhat larger than the mouth of the hole, that the hoop may rest on its edges, and strong enough to bear the weight of the hops when the bag is full, and of the man who treads them. The upper part of the bag being thus fixed by the hoop, let the rest of it hang down through the hole; but not so near to the lower floor as to touch the ground: then throw into it a bushel or two of hops, and let a man go into the bag, and with shoes that have no heels, tread the hops down on every side, as hard as he can, till they lie close. Let more hops be then cast into the bag, and be trodden down as before; and continue this till the bag is full. When that is done, untie it from the hoop, let it down, and sew up its mouth as close as you can, observing at the same time to tie up some hops in the upper corners, as was done before in the lower. The harder the hops are pressed, and the closer and thicker the bag is, the longer and better the hops will keep.

When they are thus bagged, lay them upon a boarded floor, and in a dry place; for dampness would injure them greatly. At the same time all proper measures must be taken to guard against rats and mice, which, though they do not eat hops, are very apt to spoil them, by making nests and lodging in them.

Some, in treading the hops, use a fifty pound weight, fastened to a rope, and placed in the middle of the bag. The man in the bag treads about it with his feet, and lifts it up now and then, to press them the closer together.

As soon as the hops are picked, strip their haulm or vines from off the poles, and, as your last work, lay the poles up so that they may be preserved. This is done either by stacking, piling, or housing.

The stacking is performed thus: set up three poles, like an erect triangle, or rather six poles, let into the ground with an iron crow, and placed circularly, but inclining to one another so as to meet, and be tied fast together with bands of the haulm of the hops, within a yard of the top. The poles destined for the same stack should then be erected speedily against this frame; for if they are suffered to lie on the ground, especially in wet weather, they will receive more damage in a fortnight, than by their standing out upright all the rest of the year. When they are set up, about three hundred to a stack, bind them round with a rope of twisted haulm, to keep them together. By this means the outer poles only are subject to the injuries of the weather, and keep all the inner ones dry, excepting at their tops and bottoms, the former of which are for the most part exposed to the air, as the latter are to the moisture of the earth. It is therefore a good method to cover the top of the stacks of poles with haulm, and to lay stones, bricks, or sand, at their bottom, to preserve their but ends from rotting.

Many chuse to pile them up lengthwise, in different parts of the hop ground, laying three or four old poles athwart at bottom, to preserve them from the dampness of the earth, and setting several poles erect in the ground on each side of the pile, to prevent its slipping: they then lay the poles on one another, placing the smaller ends inwards, and the bigger outward; so that the pile should consequently be somewhat longer than the poles: and when it is raised high enough, they bind it across with ropes of twisted haulm, to keep it upright and steady, and then cover it with haulm, to defend the poles from rain. This is a better method than the former; but the best way of all to preserve the poles, is to build in the hop ground a shed or two, which may serve as a shelter for picking the hops in summer, and laying up the poles in winter, with least danger of their being hurt or stolen.

From October to March, there is nothing to be done in the hop ground, but to provide and bring manure into it, and to give the alleys their winter's digging or ploughing.

If you bring dung into your ground, be sure it be well rotted, and lay it on the alleys to mix with the earth, but not on the hills, dung being apt to produce vermin, which are extremely injurious to hops. Cold dungs, such as cows and hogs dung, are better for hops than horse dung, unless the soil be cold and wet, and then hot dung, such as that of sheep, and even of pigeons, will not be improper.

A small dunging every second year is sufficient, and a plentiful dunging will serve for three years, if the soil be tolerably good.

Dung was formerly more in use for hop grounds than it is at present, experience having shewn, that lime, lime-stone, gravel, sea-sand, marle, especially the shelly marle, ashes, and many other manures, are the most proper means of correcting the defects of soils, answer the end better, and last much longer.

The management of the hop ground during the third and every subsequent year (for it will continue to yield good crops during upwards of twenty years, if it be rightly cultivated) is the same as above directed; so that it will require pretty constant care and attendance, especially from the beginning of March to the end of September. This you may lay down as a certain rule, that the more pains you take, and the greater expence you are at, in the due culture of the ground, and management of the hops, the greater will be your profit.

The charge of an acre of hop ground, in most parts of England where hops are cultivated, is computed thus: three pounds for the husbandry, four pounds for the wear of the poles, five pounds for picking and drying, one pound ten shillings for dung, one pound for rent, and ten shillings for tythe; in all, fifteen pounds a year: but in some places they pay four or five pounds an acre yearly for the rent of the land.

The hop planters in England commonly agree with hop dressers, to do, for three pounds to three pounds ten shillings an acre, all the husbandry part, in which is included the summer and winter digging of the ground, the pruning and dressing of the hops and hills, the poling and tying, several hoeings and making up the hills from time to time, the laying of the dung on the ground, and all other works, except the bringing of the dung to the ground, and the picking and drying of the hops, which last businesses are performed by others; so that a gentleman has little trouble with his hop ground: he need only be careful that the undertaker does every part of the work in its proper season; and it is so much the interest of the undertaker to be punctual in this, that, if he neglects hoing when the weeds appear, he will, by such neglect, greatly multiply his trouble and labour in rooting them out afterwards.

An English acre requires about three thousand poles, the price of which varies according to their size. In several places it is usual to give as many shillings for an hundred poles as the poles are feet long; so that for an hundred poles of twenty feet long they give twenty shillings; but where poles are in great plenty, they give but fifteen shillings for those of that length. A recruit of five hundred poles yearly will keep an acre of hop ground in constant repair; so that poles are about a third part of the yearly charge, the picking and drying are estimated at another third, and the rest is laid out in the managing of the ground.

The hop planters in England reckon, that they have but a moderate return when the produce of an acre of hops does not sell for more than thirty pounds. They frequently have fifty, sixty, eighty, or an hundred pounds for an acre; nay, some have got considerably more than even this last sum for every acre of hops, at a time when the crops of other hop grounds have failed in general, and theirs have succeeded. But if, on one hand, such extraordinary profit, being very uncertain, is not to be depended upon; so, on the other, it should not be passed over quite unnoticed, because it is among the chances which may make amends for failing years. Upon the whole, if the total charge of an acre of hops is computed as above, at fifteen pounds a year, and its produce, at an average of years, at thirty pounds only, the clear profit from an acre will be fifteen pounds a year.

Though it be common in England to see ten, twenty, thirty, or more acres of hop ground in the hands of one man; and though some who spare neither care, industry, or expence, to make their plantations of this kind flourish, receive two thousand pounds a year for their hops, notwithstanding the high price of labour, manure, and every other article relating to their proper management; yet the intelligent husbandman will easily perceive,that it is not prudent for poor farmers, or men of small fortune, to engage far in this branch of improvement; for it requires a pretty considerable stock at first to cultivate a large plantation, to furnish it with poles, and to perform every other requisite. The expence will necessarily be great, and the undertaker must expect to lie out of his money for two or three years, before he can have any return of profit; and even when his hops do come to their bearing-state, and he is in hopes of making good the charges he has been at, a bad season may frustrate his expectation. Small parcels of hops, suitable to the abilities of the farmer; for even the poorest may easily spare time and labour, to plant a few of them in a corner of his garden, or other ground, and to set sallies, willows, or ash, for poles in his hedges or elsewhere, will yield him a pretty profit, without his laying out any money: so that, in setting forth the expences and risk which attend the cultivation of hops, we mean only to caution the husbandman, whose circumstances are but middling, against embarking too far in this branch of agriculture.

Ground that is fit for the raising of hops, is also fit for the raising of hop-poles of one kind or other. But to be more particular: low, wet, cold, marshy, boggy soils, or such as are situated near rivers, are fit for all the aquatic sorts, such as poplars, abeles, alders, willows, osiers, and sallies, which produce hop-poles in four or five years from their first planting. If the soil be dry and warm, or a strong, mellow, rich loam, the ash and the chesnut, which make the best poles for hops, will thrive greatly therein, and be fit for poles in nine or ten years from the time of setting them: and if these are planted around the hop-ground, they will both shelter the ground, and afford a supply of poles, without the expence of carriage. Elms also are quick growers; and when they are planted close together, they shoot up tall and strait, and make good poles.

Ash and chesnut poles, but especially those of chesnut, are so tough and durable, that three sets of them will last twenty years: but poles of alder, poplar, abele, osiers, or sallies soon rot, or become brittle; so that five sets of them, at least, will be requisite within that time. The aquatic kinds are therefore to be esteemed only for a first supply, till the plantations of ash and chesnut become fit for the future recruit of the hop-ground.

Hops are, like other vegetables, liable to various accidents and distempers, the principal and most fatal of which are the fly, the fen or mould, the mildew, and what the planters call fire-blasts.

The reverend Dr. Hales, treating of this subject in his excellent Treatise of Vegetable Statics, gives us the following account of the state of hops in Kent, in the year 1725, which he received from Mr. Austen of Canterbury, who was a very great planter, and an accurate observer.

" In mid April, not half the shoots appeared above ground; so that the planters knew not how to pole them to the best advantage.

" Upon opening the hills, this defect of the shoot was found to be owing to the multitude and variety of vermin that lay preying upon the roots, and of which the increase was imputed to a long and almost uninterrupted series of dry weather for three months before. Towards the end of April, many of the hop vines were infested with flies.

" About the 20th of May there was a very unequal appearance, some vines being run seven feet, others not above three or four, some just tied to poles, and some not visible; and this disproportionate inequality in their size continued through the whole time of their growth.

" The flies now appeared upon the leaves of the forwardest vines, but not in such numbers here as they did in most other places. About the middle of June the flies increased, yet not so as to endanger the crop; but in distant plantations they were exceedingly multiplied, so as to swarm towards the end of the month.

" On the 27th of June some specks of fen appeared. From this day to the 9th of July the weather was very dry. At this time, when it was said that the hops in most parts of the kingdom looked black and sickly, and seemed past recovery, ours held out pretty well, in the opinion of the most skilful planters. The great leaves were indeed discoloured, and a little withered, and the fen was somewhat increased.

" From the 9th of July to the 23d, the fen increased a great deal; but the flies and lice decreased, it raining much daily. In a week more, the fen, which seemed to be almost at a stand, was considerably increased, especially in those lands where it first appeared.

" About the middle of August the vines had done growing both in stem and branch, and the forwardest began to be in hop, the rest in bloom: the fen continued spreading where it was not before perceived; and not only the leaves, but many of the burs also were tainted with it.

" About the 20th of August some of the hops were infected with the fen, and the whole branches were corrupted by it. Half the plantations had escaped pretty well hitherto, and from this time the fen increased but little: but several days of wind and rain in the follow- ing

ing week diſtorted the plants ſo that many of them began to dwindle, and at laſt came to nothing; and of thoſe which then remained in bloom ſome never turned to hops, whilſt many of thoſe which did were ſo ſmall, that they ſcarcely exceeded the ſize of a good large bur.

"We did not begin to pick till the 8th of September, which is eighteen days later than we began before. The crop was little above two hundred on an acre of ground, and not good. The beſt hops ſold this year at Way-hill, for ſixteen pounds the hundred."

As a farther means of inveſtigating of the cauſe of this pernicious diſtemper, Dr. Hales relates the following experiment, which he himſelf made on hops. In the month of July, he cut off two thriving hop vines, near to the ground, in a thick ſhady part of the garden, and left the pole ſtill ſtanding. He ſtripped the leaves from off one of theſe vines, and left them on the other, and then ſet their ſtems in known quantities of water in little bottles. That with leaves imbibed in a twelve hours day, four ounces, and that without leaves only three fourths of one ounce.

He took another hop-pole with its vines on it, and having carried it out of the hop-ground into a free and open expoſure, theſe plants imbibed and perſpired there double the quantity of the before-mentioned which had leaves on it, in the hop-ground. This ſeems to indicate that the reaſon why the hop-vines on the outſide of gardens, where they are moſt expoſed to the air, are ſhort and poor, in compariſon of thoſe in the middle of the ground, is, becauſe, being much drier there, their fibres harden ſooner, and therefore they cannot grow ſo kindly as thoſe in the middle of the ground, which, by the ſhade and ſhelter they afford each other, are always kept moiſter and more ductile.

From this perſpiration of their fluid, the ſame attentive obſerver of nature forms the following calculation. There being a thouſand hills in an acre of hop-ground, and each hill having three poles, and each pole three vines, the number of vines will be 9000, each of which perſpiring four ounces, the ſum of all the ounces perſpired by an acre in twelve hours of day will be 36000, equal 15750000 grains, equal 62007 cubic inches, or 220 gallons, which being divided by 6272640, the number of ſquare inches in an acre, it will be found, that the quantity of liquor perſpired by all the hop-vines will be equal to an area of liquor as broad as an acre, and $\frac{1}{101}$ part of an inch deep, beſides what is evaporated from the earth.

Now this quantity of moiſture, in a kindly ſtate of the air, if daily carried off, is ſufficient to keep the hops in a healthy ſtate: but in a rainy moiſt ſtate of air, without a due mixture of dry weather, too much moiſture hovers about the hops, ſo as to hinder, in ſome meaſure, the kindly perſpiration of the leaves, whereby the ſtagnating ſap corrupts, and breeds mouldy fen, which often ſpoils whole tracts of, till then, flouriſhing hop-grounds.

This was the caſe in the year 1723, when, for twelve or fourteen days, almoſt continual rains fell, about the latter half of July, after four months of dry weather; upon which the moſt flouriſhing and promiſing hops were all infected with mould, or fen, in their leaves and fruit, while the then poor and unpromiſing hops eſcaped, and produced plenty, becauſe they, being ſmall, did not perſpire ſo great a quantity as others, nor did they confine the perſpired vapour ſo much as the large thriving vines did in their ſhady thickets.

The planters of hops remark, that when a mould, or fen, has once got poſſeſſion of any part of the ground, it ſoon over-runs the whole, and that even the graſs, and other herbs under the hops, are infected with it. The reaſon probably is, that the exceeding ſmall ſeeds of this quick growing mould, or moſs (for ſuch in fact it is) coming ſoon to maturity, are eaſily blown over the whole ground; and it is undoubtedly owing to the ſame cauſe, viz. to the remaining diſperſed ſeeds of the preceding year's fen, that ſome grounds are infeſted with this diſtemper for ſeveral years running. The means before pointed out for curing the moſs on fruit-trees ſhould therefore be aſſiduouſly recurred to here, at leaſt ſo far as they can be applied to hops; and, at all events, particular care ſhould be taken to keep the land always in fine tilth, conſtantly free from weeds, and to burn all the fenny hop-vines, in a place remote from the garden, as ſoon as they are picked. We have already ſeen inſtances of the cure of moſs upon fruit-trees, by the uſe of hog's dung; and there is no room to doubt the efficacy of the ſame remedy when applied to mouldy, or moſſy hops.

Mr. Auſten, of Canterbury, obſerves that the fen is more fatal to thoſe grounds which lie low, and are cloſely ſheltered, than to ſuch as have a high, and open ſituation; to thoſe that lie ſhelving to the north, more than to thoſe whoſe ſlope is towards the ſouth; to the middle of hop-grounds, more than to their outſides, and to dry and light grounds more than to moiſt and ſtiff ſoils. This was very apparent throughout his plantations, where the land was prepared and planted in the ſame manner, and at the ſame time.

The mildew, which lights upon hops, is a white dew, that falls in ſummer at ſun-riſe, chiefly when the hops are in flower. Its fall is ſo unequal, that it ſometimes embraces a whole diſtrict, and ſometimes only parts of it. This dew dries up the hops, withers and conſumes their leaves, and conſequently ruins the crop. "There is," ſay the authors of the Journal Oeconomique, whoſe account of this diſtemper, to which hops are extremely liable, we ſhall copy here, "no other remedy from nature againſt this miſchance, except rain ſufficient to waſh the plant, and clear it entirely from this fatal dew: but as rain ſeldom comes quite ſeaſonably to the relief of the plant thus affected, artificial means have been ſought, for inſuring it againſt this accident. Some have ſurrounded their hop-grounds with hogs-dung; others have employed perſons to go through the ground with veſſels full of beech-aſhes, and to throw them upon the hops while the mildew was falling; and both ſides, profiting by their experience, pretend to have found a ſpecific preſervative againſt the bad effects of the mildew. They have even proceeded ſo far, as that each ſide affirm their's to be the only remedy. Thoſe who uſe hog-dung ſay, that the aſhes may probably hinder the action of the dew upon the plant; but that they muſt, at the ſame time, ſtop up its pores, and deprive the ſoil of its humidity; a circumſtance equally ruinous to the plant: and that, beſides, beech is not to be found every where, and if it muſt be brought from afar, the remedy would in ſome meaſure become impracticable, by the ſcarcity and difficulty of procuring it. The partiſans of the aſhes ſay, that they cannot comprehend how hog-dung laid round the hop-ground in the ſpring, ſhould preſerve ſuch virtue as to deſtroy the bad quality of this mildew in the ſummer. In ſhort, to render this diſcuſſion complete, each ſide alledges, that the trials which they have made of the other's remedy did not ſucceed.

"This diſpute, the ſubject of which is highly intereſting to all countries where beer is the common drink, excited a naturaliſt to examine the nature of this mildew; and with the aſſiſtance of a microſcope he perceived it to be full of the eggs of little inſects, which fly in vaſt numbers in the air while the hop is in bloſſom. Theſe inſects gnaw the leaves even of trees, and, like others of their ſpecies, undergo various metamorphoſes. This diſcovery induced him to believe, that, as inſects are not apt to attack perfectly healthy trees, or vigorous plants, but only ſuch as are feeble and ſickly (they being indued with ſuch nice ſenſations as to diſtinguiſh by the outſide only, perhaps by the ſmell, a plant which is vitiated within, though it may appear to us to be quite fair and ſound) hog-dung might probably give ſuch vigour to the hop, as to render theſe little animals afraid to attack it: for it has been remarked, that the inſects which nip a leaf, leave it as ſoon as they find in it an abundant juice, the ſalts of which, it may be preſumed, are too ſtrong for them; and that they fix on thoſe only which begin to decay and loſe their ſap. Aſhes may likewiſe have the power of hurting them, and its ſalts may be capable of giving them diſturbance. But late experience hinders us from giving entire credit to theſe two remedies, and ſhews, that if they have ſometimes preſerved hops from the effects of the mildew, we are not to conclude that they will always anſwer this deſirable end.

"A very good huſbandman ſaw his hops ſpoiled by the mildew, notwithſtanding the dung with which they were ſurrounded, and the aſhes that were thrown upon them: in a little time the leaves of the plants were covered with millions fong winded. Nor will this appear ftrange, if it be confidered, that in hot countries the bones of animals are harder than in the cold; and for this reafon it is, that though their fhank bones are fmaller than the horfes of this country, yet their legs are ftronger.

The Spanifh horfes, which are placed next to the Barb in rank, have a long thick neck, with a large mane; the head full large, and fometimes the fore-top large; the ears long, but well placed; the eyes full of fire, and the air noble and fpirited; the fhoulders thick, and the cheft broad; the back often fomething low; the ribs round, but the belly often too large; the croup generally round and large, though in fome longifh; the legs beautiful and without hair; the finew well detached; the paftern fometimes longifh like the Barbs; the foot a little lengthened like that of a mule; and the heel often too high. The fine bred Spanifh horfes are plump, well-fet, and place the legs well on the ground; they have alfo a great deal of motion in their paces; great agility, fire, and ftatelinefs. Their coat is generally black, or a light chefnut; though there are fome of all the ufual colours. But it is very feldom that any are feen with white legs or muzzles; the Spaniards having fuch a diflike of thefe marks, that they never breed from horfes which have them. A ftar in the forehead is all they require; but they value horfes of one intire dark colour as much as we defpife them: both thefe prejudices, though oppofite, are perhaps equally ill founded, there being very good horfes with all kinds of marks; and fome excellent among thofe which are all of one colour. This minute difference in the coat does not proceed from the nature or conftitution of the horfe; but from an external, and at the fame time fo fuperficial a quality, that a flight wound in the fkin is fufficient to produce a white fpot: further, the Spanifh horfes, whether intirely of one colour, or not, are all marked on the off-thigh with the mark of the ftud where they were bred. They are not ufually large fized; though fome rife to fourteen hands and one or two inches. Thofe of Upper Andalufia are efteemed the beft of all, though they are apt to have the head too long; but this blemifh is overlooked in confideration of their excellent qualities; as courage, gracefulnefs, obedience, ambition; and, in activity, they even exceed the Barbs. Thefe advantages recommend them above all other horfes in the world, whether for war, ftate, or the manage.

The fineft Englifh horfes greatly refemble the Arabians and Barbs in fhape; indeed they owe their origin to them; but the head is much larger, though well made, and has a fine fore-top; the ears longer, but properly placed. By the ears alone an Englifh horfe may be diftinguifhed from the Barb: but the greater difference is in the fize; the Englifh horfes are much larger and well-fet. Their common height is fourteen hands two inches, and even fifteen hands is not very extraordinary. They are all colours, and all marks; are generally ftrong, mettlefome, bold, bearing great fatigue, excellent for hunting and racing, but want air and agility; they are ftiff, and have little freedom in their fhoulders.

The Italian horfes were formerly much finer than at prefent, the ftuds having been neglected there for fome time paft paft: the kingdom of Naples, however, ftill affords fine horfes, efpecially for carriages; but they have, in general, large heads and thick necks: they are alfo untractable, confequently are difficult to be trained. Thefe defects are, however, in fome meafure, compenfated by the largenefs of their fize, their fpirit, and the beauty of their motions. They are excellent for parade, and very much affect ftatelinefs.

The Danifh horfes are of fuch a large fize, and fo well fet, that they are preferred to all others for coach horfes: fome are perfectly well moulded, though in general their formation is not very regular; moft of them having a thick neck, broad fhoulders, the back a little too long and low; and the croup too contracted for the breadth of the cheft; but they all move well, and are in general excellent for war and ftate. They are of all colours, even the moft uncommon; the pye and fpotted being feldom feen but in Danifh horfes.

Germany affords fome fine horfes, but the generality are heavy and thick winded; though moft of them come from Turkifh and Barbary horfes, of which there are many ftuds; as alfo of Spanifh and Italian horfes: thus they make no figure in hunting and racing; whereas the horfes of Hungary, Tranfylvania, &c. are very light and fleet: the Huffars and Hungarians flit their noftrils, with a view, it is faid, to mend their wind, and, at the fame time, to prevent their neighing in the field; it being affirmed that horfes, whofe noftrils have been flit, cannot neigh. It has not indeed been in my power to examine this particular; but it feems natural to think, that the operation can only weaken their neighing. The Hungarian, Croatian, and Polifh horfes are noted for having what iscalled the mark in all their fore teeth, which continues to old age.

The Dutch horfes are very good for coaches, and are moft commonly ufed in France. The beft come from Friezland. The countries of Bergue and Juliers alfo breed very good ones. The Flemifh horfes are far inferior to thofe of Holland; they have generally large heads, broad feet, and their legs fubject to dropfical fwellings. The two latter are capital faults in coach horfes.

France produces horfes of all kinds, but not many which may be called fine. The beft faddle horfes come from the Limofin, being fomething like the Barb, and excellent hunters, but of a flow growth. They muft not be broke young, nor put to any fervice till they are eight years old. Auvergne, Poitou, and the territory of Morvant, in Burgundy, alfo produces very good ponies. But Normandy, next to Limofin, affords the fineft horfes; and if not fuch excellent hunters, they are preferable to the reft for war, are better fet, and fooner trained. Lower Normandy and Cotentin, are famous for very fine coach horfes; they are lighter, and more fprightly than the Dutch horfes: Franche-compté, and the Boulonnois furnifh very good draught horfes; but a general fault in the French horfes, is the width of their fhoulders; whereas thofe of the Barbs are too much contracted. *Buffon.*

Though the moft experienced horfemen are not always agreed in fome points relating to the fhape, make, and goings of a horfe, yet they almoft always accord in this, that there ought to be a juft proportion in all his parts. That even when he is taken to pieces, and examined fingly in his particular members, though fome defects may appear, yet when they all bear a juft correfpondence one to another, and concur in fuch a manner as to render his action eafy, juft, and regular; fuch a horfe cannot be greatly difagreeable, but will, for the moft part, move well, and with a tolerable good grace. On the other hand, fuppofe a horfe has fome parts exquifitely fine, and others indifferent, which frequently happens, it will mar his beauty, and caufe him to look difagreeable, and for the moft part affect his gait and action.

In order to have a horfe beautiful and finely made, it has been agreed, on all hands, that his head fhould not be long nor too large, rather lean than flefhy; his ears thin and narrow, and of a becoming length, well fet on, pointing inwards; his brow or forehead not too broad and flat; his nofe fomewhat rifing, and of a good turn; his noftrils wide and thin; his muzzle fmall; his mouth neither deep nor too fhallow, with a ftar or fnip down his forehead, or a blaze, which is no way unbecoming, unlefs it be too large and difproportioned.

Horfes that are thus marked have generally one or more of their feet white, which is alfo very beautiful, and looks lively. His jaws fhould be thin and fufficiently wide, not approaching too near together, nor too high upwards towards the onfet, that he may have fufficient room to carry his head eafy, and in good place. His eyes well formed, fprightly, and of a middle fize. His neck fhould be arched towards the middle, arifing by a beautiful gradation out of his breaft and fhoulders, the mufcles thereof diftinct, but no where overcharged with flefh, growing fmaller and thinner, as it approaches towards his head. His fhoulders fhould be thin from the withers, with a gradual enlargement downwards, that his bofom or breaft be not too narrow nor too grofs. His fore-legs ftraight and well placed; his joints lean and bony; his knees not bending, and his pafterns not too long; his feet round and fmooth, and his finews firm and well braced; his carcafe rather round than flat; his back not too low, and for ftrength and durablenefs pretty even and ftraight. His ribs rather home than open, as they approach towards his haunches; his buttocks round, and the mufcles not too flefhy but diftinct; his hocks or gambrels neither ftanding too wide, nor too near together; his hocks fhould be lean and no ways puffed or flefhy; his pafterns fhort, his legs flat and thin, and his tail fet in a good place, rather high than low, rifing upon every motion of his body. The more thefe properties concur in any horfe, the more beautiful he muft be, efpecially when they correfpond and agree in due proportion, one to another; and the more a horfe is wanting in thefe, the more plain and ordinary he will appear.

HORSE-HOE, *fee the articles* CULTIVATOR *and* HOE.

HORSE-HOEING, the operation of cultivating plants according to the principles of the New Hufbandry; viz. by hoeing the intervals or alley between the rows of corn, and by that means fupplying the plants with frefh nourifhment.

" I have tried, fays M. de Valliers, to hoe my alleys after M. de Chateauvieux's method, which I look upon as the beft and moft expeditious; notwithftanding that feveral difficulties which I have met with in the practice of it, have obliged me to give it up. For example, the great furrow in the middle of the alley is, according to his directions, to be filled up by two turns of the plough, one on the right-hand, and the other on the left, after which it is to be opened again by one turn of the cultivator with two mould-boards, or two or three turns of the common plough.

" When I fet about this work, the firft turn of the plough, if the fhare went to any depth worth fpeaking of, always filled up the furrow in fuch manner, that to prevent its being poached by the horfes, I tried to make them walk on one fide, upon the upper-ground, and confequently very near to the rows of corn: but then, in the firft place, I could not avoid the deftruction of a great number of plants, without giving fuch attention as was not only exceffively troublefome, but almoft impracticable: and fecondly, I could plough only the furface; becaufe, as the furrow was filled, the plough could turn up but very little earth, without being choaked, and becoming extremely heavy.

" If, to fave the plants, I made the horfes tread partly upon the mould turned over into the furrow, the plough choaked equally, and for the fame reafon, whenever the furrow was cut deep. All I could do in this cafe, was to give only a fuperficial ploughing: and with that it was impoffible to ufe the cultivator with two mould-boards, to form the furrow, becaufe that inftrument cannot work in any but a loofe well-tilled ground.

" All thefe inconveniencies may not happen in a foil different from mine. I am the more inclined to think this, as M. de Chateauvieux certainly does not experience them: but at the fame time I muft likewife obferve, that this juftly celebrated gentleman has inftruments fo perfect, and directs his fervants with fuch fuperior judgment, that few can expect eafily to equal him in the practice of the New Hufbandry.

" Not being able, for the above reafons, to do with one turn of the cultivator with two mould-boards, what, as M. de Chateauvieux himfelf obferves, can frequently not be done with lefs than three or four turns of the common plough, which, added to the two turns that are given to fill up the furrow, make in all five or fix bouts, I purfued, and with great advantage, nearly the method before defcribed. I fay nearly that method, becaufe I have made fome few alterations, by which I think it is rendered both eafier and better.

" 1. I make the mould-board twelve or thirteen inches deep, inftead of nine or ten that it was before. The furrows are by this means made wider, and the plough is more eafily drawn, becaufe it finds more room to difcharge its load of earth in, and fuffers lefs preffure.

" 2. To give the fecond hoeing with the plough, inftead of continuing to turn the earth over towards that fide of the alley where only one furrow was turned up at the ending of the firft ploughing, I, on the contrary, begin this fecond at that furrow, approaching, if poffible, to within two or three inches of the row of corn, and then I make a furrow in the contrary direction, which turns the earth up againft that row.

" My reafon for ploughing fo near the rows, when I give this fecond hoeing, is, that I have obferved that the rains which fall pretty frequently in the fpring, between the firft ploughing and the fecond, harden the earth greatly, and that drought afterwards hardens it ftill more, fo that the roots of plants can no longer pierce or fpread in it with eafe: and yet nothing is more neceffary, in order to their being benefited by every culture of the earth, than that they fhould find an eafy paffage into the mould which lies next to the rows. It is therefore highly proper to ftir that mould, when the fecond hoeing with the plough is given, which, with me, is when the corn has begun to fpindle; that being the time when the plants fhoot with the greateft vigour, and when their roots ought confequently to begin to extend to fome diftance.

" I have not perceived that the plants have been at all damaged by the plough's coming fo near them. They ought to be fo much the lefs hurt thereby, as the rows are placed over a furrow which has been cut deep; a fituation which, alone, is capable of making the corn tiller, and pufh ftrongly: though the affiftance of culture is likewife neceffary, to fupply the ftalks and ears with plentiful nourifhment.

" I am the better pleafed with this method of bringing the hoe-plough almoft clofe to the rows, as it facilitates a very important operation ftrongly recommended by M. Duhamel, and which I never before thought practicable: I mean, the raifing up of the earth about the bottom of the plants; as well to give them greater nourifhment, as to prevent their being lodged. The following is my method on this occafion.

" When I fill up the furrow which I have cut as clofe as poffible to the row, I hold the plough floping, in fuch manner that the earth is forced away from it, and is raifed up about the plants. If this flope is not fufficient, which may fometimes depend on the condition of the ground, or the dexterity of the ploughman, I, in that cafe, make the mould-board two or three inches wider, when I ufed to fill the furrow, than it was when I made that furrow: and to this end I fcrew on to the extremity of the mould-board, a thin plate of iron about four or five inches wide. Thofe who practife the New Hufbandry in fo extenfive a manner as to employ feveral ploughs, will find no inconvenience in having one, larger than the reft, purpofely for this important operation. As I do not give this fecond hoeing with the plough, till after the corn has begun to fpindle, it is eafy for me to avoid burying the plants, efpecially if there are no great clods in the ground: but, at all events, I always earth the plants up as much as poffible, when there is no other danger than that of burying here and there a few of them, becaufe that accident is eafily remedied afterwards, if it be worth while.

" When I am to give the third hoeing with the plough, I confider the condition of the ground. If it is in good tilth, well loofened, and free from weeds, I ufe only the cultivator: otherwife I ufe the plough, three or four turns of which are fufficient to perform this operation in the following manner:

" The firft cut turns the earth over into the middle furrow: the fecond and third are in a contrray direction; and the fourth takes up what was loofened by the third, whereby the furrow is replaced in the middle of the alley. Some time after this, and efpecially if a fhower of rain has fallen, I cut that furrow ftill deeper, by one turn of the fingle or double cultivator, as M. de Chateauvieux directs.

" But as, even after all thefe ploughings, the great furrow may chance to be neither deep enough, nor fufficiently cleared of mould, owing either to the imperfection of the inftruments made ufe of, or to the inaptitude of the ploughman, that defect may eafily be remedied after harveft, by giving one ploughing more, which is to be begun by throwing up the earth to the right and left towards the fummit of the beds; that is to fay, over the ftubble. This practice is alfo confirmed by M. de Chateauvieux's inftructions.

" The one ploughing extraordinary which this operation requires, ought not to be thought much of; becaufe the moft important point in the New Hufbandry certainly is, the providing of a good depth of well ftirred mould, for the plants to extend their roots in."

HOT-BEDS, beds of earth enriched with manure, in order to forward vegetation, when the feafon or climate is not warm enough for the purpofe.

By means of hot-beds, fkilfully managed, the feeds of plants, brought from any country between the tropics, may be made to flourifh even under the poles.

Heat and humidity being the great inftruments of vegetation, to promote the growth of any plants, thefe muft be duly proportioned, fo as neither to exceed nor come fhort of the bounds nature has allotted for it.

The ufual way of making hot-beds, is of horfe litter and grafs mixed together, and left on a heap for eight or ten days to putrify, and then removed into a bed, and covered up with glaffes.

For raifing cauliflowers, cucumbers, melons, radifhes, and other tender plants and flowers in January or February, Mortimer directs to provide a warm place, defended from all the winds, by being inclofed with a pale or hedge of reeds or ftraw, about fix or feven feet high. Within this raife a bed two or three feet high, and three feet over, of frefh horfe dung, about feven or eight days old; then tread it down very hard, make it level, and, if you will, edge it round with boards or brick, laying fine rich mould about three or four inches thick on it. When you find by your finger, that the extreme heat of the bed is over, plant your feeds at pleafure, and fet your forks four or five inches above the bed, to fupport the frame, and cover with ftraw or mat, to fecure the feeds and plants from cold and wet; only uncover them in a warm day, an hour before noon, and cover them again an hour after. Obferve to earth up your plants, as they fhoot up, and, when able to bear the cold, tranfplant them.

In Holland they ufe hot-beds made of fand; and likewife of tanners bark, which, when once rightly prepared, will maintain an equable heat for fix months.

Bradley propofes very juftly a thermometer to be ufed to regulate the heat of the hot-beds. Thus, a hot-bed for cucumbers muft be kept fo hot as to raife the fpirit in a glafs to the fame height as the natural temperature of the weather will raife it about the end of May and June, when cucumbers will grow without artificial heat or fhelter.

HOVEL, a fhed open on the fides, and covered overhead.

HOVEN, a difeafe common to cattle, on eating too greedily of green clover. It confifts in the paunch of the creature being fwelled to a very great degree, which often, if not prevented, puts an end to the creature's life. The fureft method of curing this terrible difeafe, is that of making an incifion into the paunch of the beaft, and by that means the wind, which caufed the fwelling, will efcape through the orifice, and the creature recover.

A correfpondent of the editors of the Mufeum Rufticum has given the following account of his performing this operation.

" I took, fays he, a fharp-pointed pen-knife, and fixing my eye on the moft prominent part of his belly, thruft the blade through the integuments quite into the abdomen: there iffued out a great guft of wind very fetid, with fome water of a redifh colour: the bullock feemed eafier, but far from well; for the wound prefently clofed up, and admitted no more air to efcape; fo that I was under the neceffity of ftabbing him twice more in different parts of the belly before he was thoroughly relieved, which, by the help of a clyfter after the laft ftab, was prefently brought about: and here give me leave, gentlemen, before I leave this fubject, to give a few cautions to thofe who may be under the neceffity, one time or other, of performing this very ufeful operation: reflection and experience warrant me in them, therefore I fhall freely proceed.

" Firft then, if it be performed with a pen-knife, not to be fearful in pufhing in the blade a proper length, till you find wind iffue out; for if the wind be in the cavity of the belly, you cannot poffibly hurt the gut, the whole body of the wind being between you and it, which no reafonable bladed pen-knife can touch; and if the wind fhould be pent up in the inteftine, you muft penetrate it before the beaft can be relieved. To this laft, perhaps, it may be objected, that we run the hazard of killing the beaft by wounding the gut; but I am far from thinking fo, as I have feen many wounds of the inteftine, both in man and beaft, very happily cured: yet granting there might be fome danger in it, ftill we are certain, if the poor beaft can get no relief, it muft die; and fo circumftanced, furely, gentlemen, a doubtful remedy is better than none at all.

" Another caution is, that where thefe wounds are made in the belly with a proper pen-knife, it is not advifeable to have them fown up; for where there is a continual motion or action, as there is in the mufcles of the belly and parts adjacent, fuch a practice is not only unwarrantable, but cruel; and why fhould we not behave with humanity to the brute fpecies, as well as any other?

" My laft caution and advice is, that upon all thefe occafions, when the beaft is relieved of his wind, a proper clyfter fhould be thrown up immediately, as hot as he can bear it: thefe clyfters ftrangely relieve them, by acting as a warm, comforting bath to their diftempered bowels, and emptying the fame of the load of muck within them."

HOVER-GROUND, light ground.

HOUSE-BOTE, an allowance of timber out of the lord's woods, for the repairs of a houfe.

HULLS, the chaff, or hufks of corn.

HURDLES, are certain frames made either of fplit timber, or of hazel-rods, wattled together, to ferve for gates in inclofures, or to make fheep-folds, &c.

HURDS, or *Herds* of flax or hemp, the coarfer parts feparated in the dreffings from the tear or fine ftuff.

HURLE-BONE, in a horfe, a bone near the middle of the buttock, very apt to go out of its fockets with a hurt or ftrain.

HUSBANDRY, the bufinefs or employment of a farmer, or perfon who cultivates land, &c.

Hufbandry is divided into two kinds, and diftinguifhed by the epithets old and new. The former is that which has been practifed in all countries from the moft early times; and the latter that introduced by the ingenious Mr. Tull, and often called the horfe-hoeing hufbandry.

Experience fhews, that land, though ever fo well tilled in the autumn, when wheat, for example, is fown, hardens and foddens in the winter; its particles, beaten down by heavy rains, and funk by their own weight, approach each other daily more and more; the roots of the plants cultivated have confequently lefs and lefs room to extend themfelves in queft of their neceffary food; and their interftices in the earth become of courfe fo few and clofe, that they are not able to pierce through them, whilft weeds fpring up, and rob them of their nourifhment. By this means the earth, reduced to nearly the fame condition as if it had not been ploughed at all, is unable to affift the plants fown in it in the fpring, when they ought to fhoot with the greateft vigour. They confequently then ftand moft of all in need of the plough to deftroy the weeds, to lay frefh earth to their roots in the room of that earth which they have exhaufted, to break the particles of the ground anew, fo as to enable their roots to fpread, in order to their gathering an ample provifion of food, which then does them the greateft fervice.

In the common hufbandry, the whole attention is to provide a great ftore of nourifhment for the wheat, at a time when it fcarcely confumes any, as it then produces only a few blades, after which it is left to itfelf, at a feafon when it might, and fhould be moft affifted by proper culture; a management as prepofterous as it would be to give a child a great deal of food, and diminifh it gradually as he grows bigger; or, to ufe Mr. Tull's comparifon, to give filk-worms, before they are hatched, treble the full ftock of leaves neceffary to maintain them, till they have finifhed their fpinning, and not to allow them any when they really want being fed.

The great advantage of having land in fine tilth before it is fowed, is univerfally acknowledged: but we muft not ftop at thofe firft preparations. Plants require a continuation of culture while they grow, and muft not be forfaken till they have attained their full maturity.

Thofe who are againft the frequent ploughings ufed in the New Hufbandry, are afraid of drying the earth too much; becaufe, fay they, the moifture efcapes more eafily from a well loofened foil, than from a hard and clofe earth.

In

In anſwer to this it will appear from many of the following experiments, that, even in the drieſt weather, land cultivated according to the new method, continues conſtantly moiſter than that which is managed in the old way. Inſtead of a ſtagnant wet, more hurtful, perhaps, than beneficial, to plants; earth made fine to a good depth, is prepared, as the reverend Dr. Elliot expreſſes it, "with open mouth, to drink and retain the dew, which, when it falls upon the land that is untilled, or but poorly tilled, does not ſink far, but is carried off by the next ſun's heat." That dew is one of the greateſt fertilizers of the earth, has been repeatedly proved; and that it will penetrate ſo deep in a fine looſe ſoil, as to keep that moiſt, while the ground badly tilled is parched up, appears, among many demonſtrations, from Mr. Evelyn's experiment of digging a hole, and filling it up with its former mould well pulverized: or, as Mr. Tull obſerves, till a field in lands; make one land very fine by frequent deep ploughings, and let another be rough, by inſufficient tillage, alternately: then plough the whole field croſs-wiſe in the drieſt weather, which has continued long; and you will perceive, by the colour of the earth, that every fine land will be turned up moiſt; but every rough land will be as dry as powder, from top to bottom.

Another proof of the benefits which ariſe from ſtirring the ground well and often between plants, while they grow, and conſequently a confirmation of the fundamental principle of the horſe-hoeing huſbandry, is thus drawn by Dr. Elliot, from the common manner of raiſing Indian corn.

"The land, ſays he, being previouſly prepared, planted, and the corn come up, we plough a furrow off from the corn on each ſide, then hoe it, and the next time plough up to the corn; ſo that this tillage is nearly the ſame as is now propoſed for wheat, or whatever we would plant: only by the way, I would obſerve, that the ploughings between the rows, for Indian corn, is ſo ſhallow, that one would be apt to think it intended for nothing more than merely to kill the graſs and weeds; whereas it is found by experience, that, though there be neither graſs nor weeds, the ploughing and hoeing will make the corn grow, and that the more the land is ploughed and hoed, the better and longer it will reſiſt drought, and yield the better crop: nay, what is ſtill more remarkable, if the Indian corn be well tilled, the next crop, whether it be oats or flax, will be proportionably greater aud better; ſo that the land muſt have gained ſtrength and richneſs. If it were not ſo, why did not the Indian crop exhauſt and ſpend the ſtrength of the land, eſpecially when we conſider how large that corn is made to grow by good tillage? But we find the contrary; the better the crop of Indian corn, the better the crop will be of oats. There is no ſort of huſbandry, wherein the ſuperior force and virtue of tillage doth ſo evidently appear, as in the raiſing of Indian corn: for if you ſhould plough and harrow the beſt of land, and ſow or plant the corn, and never do any thing more to it, there will be leſs corn than if you ſhould plant poor land, and tend it well: the poor land well ploughed and hoed, ſhall bring a greater crop than the rich land. We hereby ſee the efficacy and advantage of this repeated tillage, which falls in ſucceſſively, according to the exigency and want of the plant in its ſeveral degrees of growth, and keeps the land in a proper ſtate. Why ſhould it not have the ſame effect upon wheat, and every other plant that is ſuſceptible of the like culture?"

If ſeveral rows of wheat are ſown in a poor but well ploughed land, the blades of the corn will turn yellow in the ſpring, eſpecially in dry weather. Let the earth bordering upon theſe rows be ploughed deep, in ſome places near, and in others farther from the rows, and the plants will reſume their proper colour; firſt in the places neareſt to the new ploughed ground, and afterwards gradually in the others, according to their diſtance; which proves that they recover their verdure, in proportion as their roots reach the looſe mould. This holds equally true in all plants; for Mr. Tull declares, that he does not remember ever to have ſeen a poor one contiguous to a well-hoed interval, unleſs overpowered by a too great multitude of other plants, an exception which muſt be equally made if it were a plant that required more or leſs heat or moiſture than the ſoil or climate afforded; and that, on the contrary, he has ſeen plants grow to an amazing ſize, when the earth around them has been frequently tilled. He mentions, among others, a plant of ray-graſs, which chanced to ſtand in a turnip field, where, being hoed as the turnips were, it acquired a bulk at leaſt equal to a thouſand plants of the ſame ſpecies; and a plant of muſtard, which grew higher than he could reach, ſo as to be more like a tree than an herb.

The ſtirring of the earth about the plants whilſt they grow, is productive of ſuch excellent effects, that, in ſome parts of Berkſhire, and in many places in France, they hand-hoe their corn, particularly wheat, and find that the crops amply repay all the charge and trouble of this expenſive operation; which, however, cannot be performed but in well-peopled countries. Every huſbandman will immediately ſee, how much a hoe-plough is preferable for this work, and that, to uſe it rightly, the corn muſt neceſſarily be planted in regular rows, as it is in the new huſbandry.

Our reaſon tells us, that the longeſt lived plants ſtand moſt in need of this culture. Perennials require it more than annuals, and wheat which is ſown in autumn, and does not ripen till nine months after, want it more than ſpring-corn, which occupies the ground only for a few months. The former has to conquer a ſoil rendered hard during the courſe of the winter; but the other has not that difficulty to ſurmount, though both of them, and indeed all ſorts of plants, are greatly invigorated by the repeated laying of fine freſh earth to their roots. Every one knows the vaſt efficacy of wood land, before its native ſtrength and vigour are exhauſted; and ſuch, in ſome degree, is that which this tillage furniſhes; beſides being conſtantly attended with the advantage of deſtroying weeds. How far this laſt important part of agriculture was well executed by the ſarcling, or ſarriſon, as Mr. Tull calls it, of the ancients, we ſhall not pretend to ſay, becauſe we have no clear account of the manner in which it was performed; but it does not ſeem to have been in any way equal to the horſe-hoeing huſbandry, which likewiſe, among its many other excellencies, keeps the land from going out of tilth.

We ſhall here add Mr. Duhamel's obſervations on the uſe of dung, as given by that gentleman in his Elements of Agriculture.

"It is often, ſays he, more advantageous to increaſe the fertility of land by ploughing, than by dung: 1. Becauſe, in general, only a certain quantity of dung can be had, the product of twenty acres being ſcarcely ſufficient to produce enough for four or five; whereas the particles of the earth may be divided and ſubdivided almoſt to infinity. The help derived from dung is therefore limited; whilſt no bounds can be ſet to the benefits that may accrue from ploughing.

"2. Few plants raiſed in dung ever have the fine flavour of thoſe which grow in a good ſoil moderately dunged. Our kitchen gardens and our other grounds afford daily inſtances of this truth. Pulſe, pot-herbs, and fruit, are ſeldom ſo good in the neighbourhood of great cities, where dung abounds, as in country gardens, where but little of it is uſed. The corn raiſed in thoſe exceſſively dunged lands, yields a great deal of bran, and not much fine flour, and is difficult to keep. Nice horſes will not eat oats of the growth of fields manured with human ordure. But nothing is ſo ſtriking as the difference between the wine of an undunged vineyard, and that of vines which have been greatly dunged.

"3. Dung, which is ſuppoſed to act by fermentation, cauſes indeed an inward diviſion of the particles of the earth, which muſt be very uſeful, as well as the food which it furniſhes to plants: but the plough, beſides dividing thoſe particles, changes their ſituation, and turns the ground upſide down, ſo that the part which was expoſed to the influences of the air and dews, takes the place of another part which is brought from within the earth, up to its ſurface. The conſequence of this is, that well ploughed land is not exhauſted by weeds, and that it admits the moiſture of rains and dews, together with the rays of the ſun, all of which contribute greatly to render it fertile, as has been proved by very many experiments.

"4. Dung attracts infects, and thofe infects gnaw plants. It is well known that the roots of trees planted in dunged ground, are very liable to be damaged by infects: and this is one of the chief reafons why florifts banifh dung from their gardens. Worms, grubs, and other fuch like vermin, make dreadful havock in their beds of flowers; and I have feen meadows where the grafs has been entirely deftroyed, by their eating its roots.

"I muft add, that moft forts of dung contain a great many feeds which fill the land with weeds.

"5. It is true that dung is equally ferviceable to light lands, and to ftrong; but the fame may be faid of ploughing.

"Land is too ftrong when its particles lie fo clofe together, that the roots of plants cannot extend between them, without great difficulty in queft of their neceffary food; for want of which they will remain poor and fickly: but when the ground has been well loofened by repeated ploughings, and its plants are fet at greater diftances from each other, thofe roots will be able to fpread freely on all fides, to pervade every minute chafm, and to collect fuch quantities of food as will make the plants grow ftrong and vigorous. The friendly influences of the atmofphere will then penetrate to them. What plainly proves the good effects of loofening fuch foils, is, that their fertility is fometimes increafed by a mixture of fand, inftead of dung. Now fand does not afford any nutritive fubftance; but only hinders the particles of the earth from re-uniting too clofely.

"Ploughing is equally beneficial to light lands, for the very contrary reafon; though thefe do not require fo much of it as the other. There is no danger of their being exhaufted by any expofure to the fun; but, on the contrary, they acquire an additional degree of fertility by the ftirring and grinding of their particles, and are thereby the better fitted to receive the moifture of rains and dews, and the falutary influences of the air and fun; whilft their inward pores are at the fame time better adapted to the proper extenfions of the roots of plants, by their being leffened.

"But let the benefits arifing from dung be ever fo great, let the means of obtaining enough of it be ever fo eafy, and let even its defects be corrected as much as can be, ftill it will not be the lefs true, that frequent ploughing is of infinite fervice to land.

"For this reafon it is, that land intended for wheat is ploughed three or four times before the grain is fowed. Some farmers, who could not dung all their lands, ploughed part of them double the ufual number of times, and reaped greater crops from thefe, than from thofe which were dunged. The expence of the ploughings extraordinary will be much lefs than the price of the dung neceffary for the land, if the farmer is obliged to purchafe it.

"In 1759, M. Delu gave three ploughings to fome of his fields intended for oats; and though that year was very dry and unfavourable to fpring corn, his oats kept up well till they were perfectly ripe, and yielded a full crop of excellent grain.

"He gave five ploughings to a piece of wheat-land, which had not been dunged, and at harveft, had taller and finer corn there, than in the neighbouring grounds which had been dunged and cultivated in the ufual way. In fhort, the advantage of thorough tillage, while the plants are growing, is fo great, that, in many places, it has been found amply to repay even the expence of digging between the rows of corn.

"The farmer muft not think of practifing the New Hufbandry in land which cannot be brought to a fine tilth: for as no remedies are proper for all difeafes, fo no one culture can fuit every kind of foil.

"I have met with very zealous hufbandmen, who have been in a great hurry to procure all the inftruments proper for the horfe-hoeing hufbandry, before they had examined whether their ground was fit for ufing them. In walking over the fields, I have found them in fo bad order as to be full of clods, ftones, and all forts of weeds: only the bare furface of the land had been fcratched, by what they called ploughing; and indeed their common inftruments of tillage were fo imperfect, that it was hardly poffible for them to do more. I advifed them to deftroy thofe weeds by good and frequent ploughing, to procure good inftruments, to loofen the ground to a proper depth, to collect good manures, to drain their land well by trenches and ditches, and, in fhort, to practice the Old Hufbandry completely, before they attempted the new; for, in fact, all the requifites in the former muft be the foundation of the latter.

"To anfwer the ends of this hufbandry, the feeds muft be diftributed fo fparingly, that each plant may have room to extend its roots in fuch manner that they may be able to collect an abundant quantity of food; each plant muft be enabled to tiller greatly, fo as to produce a confiderable number of ftalks; and each ftalk muft be enabled to bear a fine long ear, well filled with grains to its very point.

"To effect the firft of thefe qualities, the field, after being thoroughly ploughed and well harrowed, muft be divided by furrows, the fpaces between which may be of fuch breadth as fhall be judged moft proper; for neither their precife width, nor the diftance between the rows of corn, is yet fully determined. In the middle of thefe fpaces, which will be diftinguifhed by the name of beds, the wheat, or other grain, is to be fown in one, two, or more rows. An inch will be fufficient for the diftance between the grains, lengthwife of the row; though that may be fomewhat lefs, if the ground be not very good for wheat; or, on the contrary, fomewhat more if it be excellent for that grain. By this diftribution, each plant will find, in the intermediate fpaces between the beds, and in the beds themfelves, a fufficient extent of earth wherein to collect its neceffary food; for thofe intermediate fpaces, which I fhall call alleys, muft be wide enough to admit of ftirring the ground in them while the plants grow: but to anfwer the fecond and third intentions, it is of confequence that thefe ftirrings be performed at proper feafons, becaufe each of them is to produce its particular effect.

"It is effentially neceffary that the rows of corn be fown very ftraight; a circumftance which, though it be attended with fome trouble, ought not to difcourage the hufbandman, becaufe the great difficulty will be only the firft time. After the ground has been once rightly fown, it will be eafy to continue in the fame regular tract every following year, without taking the precautions I am now going to obferve.

"If the field be not very large, a furrow traced with a fpade or pickaxe, directed by a line ftretched acrofs the ground, will enable the ploughman to guide the horfe that draws the drill; and he will take care to leave a proper interval between one furrow and another, if three rows are to be fown.

"If the extent of ground be too great for the above method, poles or ftakes may be ftuck, five feet afunder, at each end of the field, to guide the ploughman, who, with a common plough, will trace fmall furrows, by the help of which the horfe and drill may be properly directed.

"It will be right, if poffible, to fuit the direction of the furrows to the declivity of the land, that the water may drain down to the loweft part of the field, where a ditch fhould be dug to carry it off: and it will alfo be neceffary, to make them lengthwife of the field, if convenient, that the lefs ground may be loft by the fpace which muft be left for the plough to turn in.

"After the feed is put into the hoppers of the drill, the horfe which draws this inftrument muft be made to walk flowly in the furrow before traced by way of guide: and in order to drop as nearly as poffible the intended quantity of feed, the outlet of the hopper muft be proportioned to the fize of the grain.

"As it will be fomewhat difficult to manage the drill rightly at firft, till the hufbandman becomes ufed to it, he fhould look over his field as foon as the corn has fprouted, and then drop by hand a few grains in the places where it may have failed.

"The land fhould be fown about the middle of September, or, at fartheft, by the end of that month: and it will be right always to try the goodnefs of the feed beforehand, by fowing fifty or an hundred grains of it in a fine mould, or moift ground, where it will foon appear whether they all rife.

"Land which retains water ſhould be ploughed once in October, when the weather is fine. In doing this, a furrow ſhould be firſt cut in the middle of the alleys, and then it ſhould be filled with the earth on each ſide, even ſo far as to arch it up, and leave only a ſmall furrow on either ſide, cloſe to the beds, to drain off the wet, which would prove very prejudicial to the plants if it were to remain long near their roots. This looſening of the earth will alſo fit it for being mellowed by the winter's froſts; to which, however, care muſt be taken not to expoſe the roots of the corn, by leaving them too bare of mould. The moſt proper time for this ſtirring of the ground is when the plants have ſhot out ſome blades.

"The ſecond horſe-hoeing, which ſhould be given as ſoon as the hard froſts are paſt, that is to ſay, by the end of March, is intended to make the plants tiller; and will have this effect, if, after the earth near the rows has been ſtirred a little, that which was before laid up in the middle of the alleys be returned back to the furrows at their ſides. This earth, having been mellowed during the winter, will afford excellent nouriſhment to the plants now beginning to vegetate apace, and they will ſoon put forth their multiplied ſtalks.

"The third hoeing, which is the ſecond after winter, and is intended to ſtrengthen the ſtalks, ſhould be performed when the ears of the corn begin to appear. This culture, which is looked upon as the leaſt important of all, and is ſometimes even omitted without any great inconvenience, need not be any thing more than a ſlight ſtirring of the earth, in which it will however be right to begin to hollow the alleys.

"The laſt ſtirring of the earth between the rows of corn is one of the moſt important, being that which makes the grains ſwell, and grow full bodied to the very point of the ear. The moſt proper time for this is when the ears begin to bloom: but as the corn is then high, only one furrow can be cut in the middle of the alleys, the earth of which ſhould be laid up to the ſtems of the plants on each ſide. The plough will hardly be able to paſs more than twice in this furrow, which ſhould, however, be made as deep as poſſible, in order to bank up the greater quantity of earth. By this operation, the now fallow alleys are prepared for the next ſowing; for it is in the middle of them that the corn is to be planted the following year; and the now eared wheat is earthed up, to prevent its being lodged; though in general corn thus cultivated is leſs apt to be beaten down, than that which is raiſed in the common way, becauſe the ſtraw of this, being more expoſed to the air, becomes harder, and acquires a firmer texture, eſpecially toward its bottom. It is for this reaſon that a tuft of corn, which ſtands quite ſingle, is ſcarcely ever beaten down by the weather.

"Theſe repeated hoeings of the earth will certainly be rewarded with a very plentiful crop, unleſs the ſeaſons prove extremely bad.

"When the corn is reaped, all poſſible care ſhould be taken not to trample upon the adjoining ploughed ground.

"It is well known, that vigorous plants do not ripen their ſeeds ſo ſoon as thoſe which have been ſtinted in their growth: for this reaſon the corn cultivated according to the principles of the new huſbandry, ripens later than in the common way, and ſhould therefore be ſown ſomewhat earlier.

"We will now ſuppoſe that the crop is reaped, and that the ſame field is to be ſown again with wheat the next year, and every year after, as it may be, becauſe the rows of corn are placed each time in the middle of the former alleys, which have been ploughed during the whole year, without producing any thing. Thus, the only difference between this new method and the old huſbandry is, that inſtead of reſting, or fallowing, a whole field, whilſt another whole field is under corn, and each of them is ſeparate from the other; the fallow here is in the ſame field as the corn, being interpoſed by means of alleys, which are the part reſted between the beds, which are the part cultivated: but there is this great advantage here, that the ſtirring of the earth in the alleys, which are not planted, not only prepares the ſoil admirably for being ſown the next year, but invigorates the plants actually growing in the beds.

"If it be thought proper to dung the alleys, in order prepare them for the reception of the ſeed, the dung, which ſhould be thoroughly rotten, muſt be laid in the bottom of the deep furrow before made in the middle of them, and there covered with the earth which was thrown up towards the rows of wheat. If the land does not want dunging, this deep furrow is filled up without it; and this ſhould be done immediately after harveſt, that there may be time to give the ground another ſtirring, which need only be a ſlight one, before the ſowing of the rows, which are now to be in the middle of the former alleys; and the alleys of this year will be in the place of the laſt year's ſtubble.

"Though land, cultivated according to the principles of the new huſbandry, does not require ſo much dunging as that which is managed in the old way, yet this manure will always help to enrich the ſoil, eſpecially if it be uſed in the manner here directed. By being thoroughly rotten when it is laid in the furrow, and there covered over immediately after harveſt, it will have time to mellow and diffuſe its influence, and not be apt afterwards to choak up the ſhares of the drill; an inconvenience which does not happen with pigeons dung, which therefore need not be ſtrewed till the ground is ploughed for ſowing.

"It is farther obſerved:

"1. That if dung be uſed for the ſecond year's crop, very little of it will ſuffice, becauſe it need only be laid in the bottom of the furrows.

"2. That there can hardly be any occaſion for dung this ſecond year, becauſe, if the earth of the beds in which the wheat grew was good, that of the alleys, of the ſame ſoil, muſt be ſtill better, by reaſon of its having been fallowed and well tilled.

"3. That the ſecond year's wheat is placed in a moſt advantageous ſituation, its roots having a depth of twelve or fifteen inches to extend themſelves in, by means of the furrow which was in the middle of the alley. For this reaſon, corn ought to thrive beſt in thoſe lands which have been longeſt cultivated according to the new huſbandry.

"The earth in the alleys is to be horſe-hoed during the ſecond year, in the ſame manner, and at the ſame ſeaſons, as in the firſt.

"This frequency of hoeing ought not to be objected to; for the labour of the firſt hoeing, to make the furrows on each ſide of the rows, and lay the earth up in the middle of the alleys, cannot be great; and the ſecond only returns that earth into thoſe furrows: the third is only to ſtir the ſurface of the ſoil: the fourth and laſt is to make the deep furrow in the middle of the alleys, and bank up the rows of corn on each ſide, with the earth taken out of it; ſo that neither of theſe operations ever extends to above a third part of the ground, at any one time.

"The whole field might indeed be ploughed up after harveſt: but I would adviſe the huſbandman not to touch the ſtubble then, becauſe the rows of that will help him to guide the drill in ſtraight lines, and the yet unrotten ſtraw might be apt to clog the ſhares of the drill, ſo as to prevent their working properly. However, if the ſtubble be very ſhort, this caution becomes the leſs material, and the whole field may then be ploughed; though ſtill it will be neceſſary to plough it again in October, in order to make drains to carry off the wet.

"It is almoſt needleſs to obſerve, that all the operations of which I have been ſpeaking, muſt often be performed either a little earlier, or ſomewhat later, according as the year is more or leſs forward; and that it will always be neceſſary to wait till the ground is dry enough to be ploughed without danger of its clodding; a circumſtance which varies greatly, according to the nature of the ſoil."

The editors of the laſt edition of Mr. Tull's Horſe-hoeing Huſbandry, give, in their preface to that work, the following comparative calculation of the expence and profit of the old method of culture and the new, drawn up by a gentleman who has practiſed both for ſome years, and who has no attachment to the new huſbandry, farther than he has found it anſwer in his trials. They candidly appeal to experience, "whether every article in this calculation is not eſtimated in favour of the common huſbandry; whether the expence be not rated lower than most farmers find it; and whether the crop be not such as they would rejoice to see, but seldom do.

" In the new husbandry, every article is put at its full value, and the crop of each year is computed four bushels short of the other, though, in several years experience, it has equalled, and generally exceeded, those of the neighbourhood in the old way."

An Estimate of the Expence and Profit of Ten Acres of Land, in Twenty Years.

I. In the Old Way.

	l. s. d.	l. s. d.
First year for wheat costs 33l. 5s. viz.		
First ploughing at 6s. per acre —	3 0 0	
Second and third ditto, at 8s. per acre	4 0 0	
Manure, 30s. per acre — — —	15 0 0	
		22 0 0
Two harrowings and sowings, at 2s. 6d. per acre — — — —	1 5 0	
Seed, three bushels per acre, at 4s. per bushel — — — — —	6 0 0	
Weeding, at 2s. per acre — —	1 0 0	
Reaping, binding, and carrying in, at 6s. per acre — — — — —	3 0 0	
		11 5 0
Second year for barley costs 11l. 6s. 8d.		
Once ploughing, at 6s. per acre —	3 0 0	
Harrowing and sowing, at 1s. 6d. per acre — — — — — —	0 15 0	
Seed, four bushels per acre, at 2s. —	4 0 0	
Weeding, at 1s. per acre — —	0 10 0	
Cutting, raking, and carrying, at 3s. 2d. per acre — — — —	1 11 8	
Grass-seeds, at 3s. per acre — —	1 10 0	
		11 6 8
Third and fourth years lying in grass cost nothing.		44 11 8
So that the expence of ten acres in four years comes to 44l. 11s. 8d. and in twenty years to		222 18 4
First year's produce is half a load of wheat per acre, at 7l. per acre — — — — — —		35 0 0
Second year's produce is two quarters of barley per acre, at 1l. per acre — — —		20 0 0
Third and fourth year's grass is valued at 1l. 10s. per acre — — — — — — —		15 0 0
So that the produce of ten acres in four years is		70 0 0
And in twenty years it will be — — —		350 0 0
Deduct the expences — — — — — —		222 18 4
And there remains clear profit on ten acres in twenty years by the old way — — —		127 1 8

II. In the New Way.

	l. s. d.	l. s. d.
First year's extraordinary expence is For ploughing and manuring the land, the same as in the old way —		22 0 0
Ploughing once more, at 4s. per acre	2 0 0	
Seed, nine gallons per acre, at 4s. per bushel — — — — —	2 5 0	
Drilling, at 7d. per acre — —	0 5 10	
Hand-hoeing and weeding, at 2s. 6d. per acre — — — — —	1 5 0	
Horse-hoeing, six times, at 10s. per acre — — — — — —	5 0 0	
Reaping, binding, and carrying in, at 6s. per acre — — — —	3 0 0	
The standing annual charge on ten acres is — — — — —	13 15 10	
Therefore the expence on ten acres in twenty years is — — —		275 16 8
Add the extraordinaries of the first year, and the sum is — — — — — — — —		297 16 8
The yearly produce is at least two quarters of wheat per acre, at 1s. 8d. per quarter, which on ten acres in twenty years amounts to		560 0 0
Therefore, all things paid, there remains clear profit on ten acres in twenty years, by the new way — — — — — — —		262 3 4

" So that the profit on ten acres of land in twenty years, in the new way, exceeds that in the old by one hundred and thirty-five pounds one shilling and eightpence, and consequently is considerably more than double thereof: an ample encouragement to practise a method whereby so great advantage will arise from so small a quantity of land, in the compass of twenty-one years lease; one year being allowed, both in the old and new way, of preparing the ground.

" It ought withal to be observed, that Mr. Tull's husbandry requires no manure at all, though we have here, to prevent objections, allowed the charge thereof for the first year; and moreover, that though the crop of wheat from the drill-plough is here put only at two quuarters on an acre, yet Mr. Tull himself, by actual experiment and measure, found the produce of his drilled wheat crop amount to almost four quarters on an acre: and, as he has delivered this fact upon his own knowledge, so there is no reason to doubt of his veracity, which has never yet been called in question. But that we might not be supposed to have any prejudice in favour of his scheme, we have chosen to take the calculations of others rather than his, having no other view in what we have said, than to promote the cause of truth, and the public welfare."

The following account of the advantage of the drilling and horse-hoeing tillage, above the broad-cast tillage, is extracted from the account of the Experiments sent to the Society of Arts, &c.

The manner and expence of cultivating lands for corn in several counties in England, being materially different, it is thought proper to prefix to these calculations of the comparative profits arising from the broad-cast, and from the drilling and horse-hoeing tillage in Cumberland and Yorkshire, an account as well of the prices of labour, &c. as of the manner in which each kind of tillage is practised in these several counties: to the end that farmers, who are the persons more immediately interested, may have every circumstance exposed to their view, that may the better enable them to form their judgments on the following estimate:

The Prices of Labour, &c. in Cumberland.

	s. d.
Ploughing per acre — —	3 6
Manure, per one horse cart load — —	0 4
Lime per bushel (Winchester) — —	0 2
Hire of man and one horse cart per day —	1 10
Ditto of a labourer per day — —	0 10
Horse-hoeing per acre drilled — —	1 2
Rent of land per acre — —	8 0
Harrowing per acre — —	0 6
Wheat per bushel — —	4 0

The Kind of Soil on which the Experiments were made, in Cumberland.

A heavy moist soil on a clay bottom, rather too stiff for barley.

The Broad-cast Tillage of one Acre of Land, in Cumberland.

N. B. The land on which the experiments were made in this county, were ploughed out of lea, and bore a crop of oats.

The first Year for Turnips.	Expences. l. s. d.
Three ploughings with two horses, the first in March, second in May, third in June —	0 10 6
60 one horse cart loads of manure —	1 0 0
90 bushels (Winchester) of lime —	0 15 0
Six days work of man and horse leading the manure, and two ditto the lime —	0 14 8
Two days work of a labourer spreading the manure — —	0 1 8
Seed and sowing — —	0 2 0
Three harrowings — —	0 1 6
Total expence the first year	3 5 4

N. B. In the above, as well as in all the following calculations, the expence of reaping, threshing, and sending

ing to market, is omitted, it being countervailed by the price or value of the ſtraw (according to general eſtimation) which laſt is likewiſe omitted in the computation of the value of the crops.

The value of the crop of turnips computed 3l.

The Prices of Labour, &c. in Yorkſhire.

	s.	d.
Ploughing per acre	4	0
Manure per load	2	6
Hoeing an acre of turnips in broad-caſt, during a ſeaſon	6	0
Hand-hoeing per acre drilled	2	6
Horſe-hoeing ditto	1	0
Drilling per acre	0	6
Rent of land	15	0

The Kind of Soil on which the Experiments were made, in Yorkſhire.

Inclining to a hazle mould, but light and dry.

The Broad-caſt Tillage of one Acre of Land, in Yorkſhire.

The firſt Year for Turnips.	Expences. l.	s.	d.
Four ploughings	0	16	0
Harrowing and ſeed	0	2	0
Hoeing the turnips	0	6	0
15 load of dung	1	17	6
Total expence	3	6	0

Value of the crop of turnips, 2l.

The Broad-caſt Tillage of one Acre of Land, in Cumberland.

The ſecond Year for fallow, and the third Year for Wheat.

	Expences. l.	s.	d.
Four ploughings	0	14	0
Four harrowings and ſowing	0	2	6
Seed-wheat	0	12	0
Total expence	1	8	6

The value of the crop, viz.
3 quarters of wheat, at 4s. per buſhel, 4l. 16s.

N. B. In this country the broad-caſt tillage does not admit a fourth year's crop without a conſiderable loſs: therefore after the third year the land is again manured, and the ſame proceſs repeated for three years more, and ſo on from three years to three years.

The Broad-caſt Tillage of one Acre of Land, in Yorkſhire.

The ſecond Year for Barley.

	Expences. l.	s.	d.
Two ploughings and harrowings	0	10	0
Three buſhels of ſeed-barley and weeding	0	8	0
Total expences	0	18	0

Value of the crop of barley, viz
Four quarters at 18s. per quarter, 3l. 12s.

The third Year for Clover.

	l.	s.	d.
14 pounds weight of clover-ſeed	0	4	0

Value of two crops clover, 1l. 10s.

The fourth Year for Wheat.

	l.	s.	d.
One Ploughing and Harrowing	0	7	0
Three buſhels of ſeed and weeding	0	16	0
Total expence	1	3	0

Value of the crop of wheat, viz.
Three quarters at 1l. 16s. per quarter 5l. 8s.

N. B. In this kind of tillage the land never lies fallow: and after the fourth year, the ſame proceſs is repeated for four years more, and ſo on.

The Drilling and Horſe-hoeing Tillage of one acre of Land in Cumberland.

N. B. The land on which the experiments were made in this county were firſt ploughed out of lea, and bore a crop of oats.

The firſt Year for Turnips.	Expences. l.	s.	d.
Three ploughings with two horſes, viz. the firſt in March, ſecond in May, third in June	0	10	6
30 one horſe cart loads of manure	0	10	0
45 buſhels (Wincheſter) of lime	0	7	6
Three days work of a man and horſe leading the manure, and one ditto the lime	0	7	4
One day's work of a labourer ſpreading ditto	0	0	10
Seed	0	0	6
Harrowing and drilling	0	1	6
Three horſe-hoeings, each equal to one-third of an acre	0	3	6
Total expence	2	1	8

Value of the crop of turnips 2l. 10s.

The ſecond Year for Barley.	l.	s.	d.
Two ploughings, viz. the firſt in March, and the ſecond in April or May	0	7	0
Seed-barley, viz. one buſhel (Wincheſter)	0	2	0
Harrowing and drilling	0	1	6
Three horſe-hoeings	0	3	6
Total expence	0	14	0

Value of the crop of barley, 1l. 16s.

The third Year for Wheat.	l.	s.	d.
One ploughing before Michaelmas	0	3	6
Seed-wheat	0	3	6
Harrowing and drilling	0	1	0
Five horſe-hoeings	0	5	10
Total expence	0	13	10

Value of the crop of wheat, viz. 15 buſh. 3l.

N. B. The fourth year a ſecond crop of barley, and the fifth year a ſecond crop of wheat at the like expence, and with like profit, and then after the fifth year, the whole proceſs is repeated. The ridges are formed five feet and half wide, and a treble row of drills ſeven inches aſunder, on the top of each ridge.

The Drilling and Horſe-hoeing Tillage of one Acre of Land, in Yorkſhire.

For Barley.	Expences. l.	s.	d.
Two ploughings, viz. the firſt in autumn, and the ſecond in ſpring	0	8	0
Seed-barley, viz. one buſhel, or four pecks	0	2	$1\frac{1}{2}$
Three horſe-hoeings, viz. on the 30th of May, 7th of June, and the beginning of July	0	3	0
One hand-hoeing on the 8th of June	0	2	6
Total expence annually	0	15	$7\frac{1}{2}$

Value of the crop, viz. 3 qrs. 6 buſh. 2 pecks, at 18 s. per qr. 3l. 8s. $7\frac{1}{2}$d.

For Wheat.	l.	s.	d.
Two ploughings	0	8	0
Seed-wheat, viz. one buſhel, or four pecks	0	4	4
Three horſe-hoeings	0	3	0
One hand-hoeing	0	2	6
Total annual expence	0	17	10

Value of the crop of wheat, viz. 2 qrs. at 1l. 16s. per qr. 3l. 12s.

N. B. The ridges are here formed four feet and a half wide; and a double row of ſeed, ten inches aſunder, drilled on the top of each ridge: the intervals for horſe-hoeing being thus three feet eight inches. The ſame proceſs, and the ſame expence, is repeated annually: and a piece of ground in Yorkſhire, under this method of tillage, had yielded the eighth ſucceſſive crop, viz. four of barley, and four of wheat, at the time the account was ſent to the Society, of the values above ſpecified, without ever having had any manure beſtowed upon it, and without ſhewing any ſign of impoveriſhment, being then, to all appearance, in full heart.

An Eſtimate of the Advantage of the Drilling and Horſe-hoeing Tillage, above the Broad-caſt Tillage, as both are practiſed in Cumberland and Yorkſhire.

In order to aſcertain the proper method of calculation, whereby to arrive at a deciſive eſtimate of the comparative profits from the two kinds of tillage; it becomes, in ſome meaſure, expedient here to inſert an abſtract of two experiments, contained in the accounts mentioned in the title page: and the rather that experiments of this kind, coming ſo properly authorized to the Society, ought not to remain in obſcurity. Theſe experiments were made to prove the difference of the acreable produce, and the difference of the rate of increaſe from the ſeed ſown as well in broad-caſt, as in various forms of drilling

In Yorkſhire.

Quantity of ſeed ſown on one acre.

		Pecks.	Prod	Rate of increaſe.
A. D. 1763.	In broad-caſt - -	10	178	Seventeen-fold.
	In equidiſtant drills -	6	194	Thirty-two-fold.
	In double drills, 11 inch. aſunder, and 4 feet 10 inches interval -	3	102	Thirty-four-fold.
	In treble drills, 7 inches aſunder, and 4 feet 3 inches interval -	2	100	Fifty-fold.

Quantity of ſeed ſown on one acre.

		Pecks.	Pro	Rate of increaſe.
A. D. 1765.	In broad-caſt (barley) -	9	137	Fifteen-fold.
	In equidiſtant drills -	8	144	Eighteen-fold.
	In double drills, 10 inch. diſtant, and 3 feet 8 inches interval - -	4	136	Thirty-four-fold.

N. B. This laſt is that preferred in the Yorkſhire drilling-tillage before ſpecified.

Now firſt, That the rate of increaſe alone is not the proper ſtandard to form a judgment of the profits of either kind of tillage, will be evident from a ſlight attention to the foregoing experiment. The quantity of ſeed requiſite to ſow an acre of land is in itſelf ſo ſmall, viz. at the utmoſt but eight or ten pecks, that it is of very little conſequence to a farmer, whether he ſows ten pecks (as in the common broad-caſt) or only two pecks (as in the treble drill method) on an acre. But when he conſiders that from the firſt, his acre will produce him 178 pecks, and from the ſecond but 100 pecks; there appears ſuch a difference in the acreable produce as muſt engage his attention: ſo that taking nothing into the account beſides the quantity of ſeed ſown the acreable produce, and the rate of increaſe, he muſt neceſſarily prefer the method which gives him the 178 pecks on an acre, to that which gives him only 100 pecks, notwithſtanding that the latter is an increaſe fifty-fold, and the former only ſeventeen fold.

But, ſecondly, That neither is the acreable produce the proper foundation for our calculations, is evident from this, that the expence of cultivating for the 178 pecks per acre, may happen to be proportionably greater than that of cultivating for the 100 pecks per acre, ſo that the profit upon each may be equal; in which caſe the farmer muſt prefer the 100 pecks per acre as affording him an equal profit at a leſs expence, though in fact it be the leſſer acreable produce. And if the expence of the 178 pecks per acre were any thing greater than proportionable, there would then be a double reaſon for preferring the leſſer acreable produce, viz. as giving a greater profit at a leſs expence.

Laſtly, It is plain from what has been ſaid, that the proper ground for calculating the comparative profits of each kind of tillage will be found in conſidering the expences and the returns made in each, in any given time, and when corn is at any given price. For thus it will eaſily and plainly appear, in which of theſe two kinds of tillage a farmer can turn his ſtock of money to beſt account; which is the only material queſtion. Nor can the inſtability of the price of corn, any wiſe impeach the certainty of this method of calculation, ſince to whatever price it riſes or falls, the returns from each kind of tillage muſt riſe or fall in like manner; ſo that the difference of profit muſt always remain proportionally the ſame.

This then is the method of calculation obſerved in the following eſtimate.

In Cumberland.

Broadcaſt tillage of one acre.

	Seed ſown.	Expence. l. s. d.	Value of the crop l. s. d.
1ſt Year —	Turnips	3 5 4	3 0 0
2d Year — 3d Year —	Fallow } Wheat }	1 8 6	4 16 0
Total — —		4 13 10	7 16 0
Deduct expences			4 13 6
			3 2 10
Deduct three years rent —			1 4 3
Neat profit for one acre in broadcaſt for three years			1 18 2

Drilling tillage of one acre.

	Seed ſown.	Expence. l. s. d.	Value of the crop l. s. d.
1ſt Year —	Turnips	2 1 8	2 10 0
2d Year —	Barley	0 14 0	1 16 0
3d Year —	Wheat	0 14 10	3 0 0
Total —		3 9 6	7 6 0
Deduct expences			3 9 6
			3 16 6
Deduct three years rent —			1 4 0
Neat profits from one acre in drilling for three years — —			2 12 6

In Yorkſhire.

Broadcaſt tillage of one acre.

	Seed ſown.	Expence. l. s. d.	Value of the crop l. s. d.
1ſt Year —	Turnips	3 1 6	2 0 0
2d Year —	Barley	0 18 0	3 12 0
3d Year —	Clover	0 4 0	1 10 0
4th Year —	Wheat	1 3 0	5 8 0
Total —		5 6 6	12 10 0
Deduct expence			5 6 6
			7 3 6
Deduct four years rent —			3 0 0
Neat profit in four years —			4 3 6

Drilling tillage of one acre.

	Expence. Barley. l. s. d.	Expence. Wheat. l. s. d	Value of the crop. Barley. l. s. d.	Value of the crop. Weat. l. s. d.
1ſt Year	0 15 7½	0 17 10	3 8 7½	3 12 0
2d Year	0 15 7½	0 17 10	3 8 7½	3 12 0
3d Year	0 15 7½	0 17 10	3 8 7½	3 12 0
4th Year	0 15 7½	0 17 10	3 8 7½	3 12 0
Tot.	3 2 6	3 11 4	13 14 6	14 8 0
Deduct expences			3 2 6	3 11 4
			10 12 0	10 16 8
Deduct four years rent			3 0 0	3 0 0
Neat profit in four years			7 12 0 Barley.	7 16 8 Wheat.

Calculation

Calculation in Cumberland.

	l.	s.	d.
The neceffary expences for three years tillage of one acre in broadcaft, viz. 4 l. 13 s. 10 d. producing neat profit only	1	18	2
Will, from the above accounts, be fufficient to till 1 Acr. 1 R. 16 P. for the fame number of years in drilling, and will produce neat profit	3	10	9
Difference of profit from 4 l. 13 s. 10 d. in three years in favour of drilling	1	12	7

But fince this method of drilling tillage requires a renewal of manure only every five years, whereas the broadcaft method requires it every three years; therefore, taking the profits in each kind of tillage for fifteen years together, will give the true proportions.

	l.	s.	d.
Thus the faid fum of 4 l. 13 s. 10 d. in broadcaft tillage for fifteen years, will produce a neat profit of	9	10	10
But the fame expended in drilling and horfe-hoeing tillage, will, in the fame number of years, produce a neat profit of	22	1	2½

And whatever price corn, &c. bears, the returns made by each kind of tillage will bear a price proportional to thefe two fums; or the profits on the drilling tillage in this county for fifteen years together, will always be to that on the broadcaft tillage, for the fame time as 22 l. 1 s. 2½ d. is to 9 l. 10 s. 10 d. that is as 23 is to 10 nearly.

Calculation in Yorkfhire.

	l.	s.	d.
The neceffary expences for four years tillage of one acre in the improved broadcaft tillage, viz. 5 l. 6 s. 6 d. producing neat profit only	4	3	6
Will be fufficient to till 1 acre 2 R. 22 P. 6. for the fame number of years in the drilling method, and will produce a neat profit			
In barley	12	19	0
In wheat	12	17	1½

Which is more than three times the profit that is yielded by the broadcaft method.

A comparative Calculation of Expence and Profit between the Drill and the Common Hufbandry, taken from Mr. Baker's Report to the Dublin Society of his Experiments in Agriculture, for the Year 1765. Publifhed by Order of that Society.

An Eftimate of the Expence upon a Plantation * Acre of Wheat, in the Common Hufbandry.

	l.	s.	d.
To the firft ploughing, commonly called breaking for fallow, 8 horfes, 8 s. 2 ploughmen, 1 s. 4 d. 2 drivers, 1 s.	0	10	4
To the firft harrowing, 4 horfes, 4 s. a driver, 6 d.	0	4	6
To the fecond ploughing, commonly called gaurowing	0	10	4
To the fecond harrowing	0	4	6
To the third ploughing, commonly called ftretching	0	10	4
To fowing the feed, 8 horfes, 8 s. 2 ploughmen, 1 s. 4 d. 2 drivers, 1 s. the feedman, 8 d.	0	11	0
To feed wheat, one barrel	1	0	0
To rent for the year of fallow	0	18	0
To ditto, the year the crop is growing	0	18	0
	5	7	0

In this account 40 s. are charged for 40 horfes, imployed in the culture of one acre for wheat, in the common hufbandry; a charge which ought to be confidered by the farmer; for he actually buys and maintains his horfes for this bufinefs.

The crop which follows wheat is generally oats; but fometimes peas are fown inftead of oats; with fome, the practice is to let the peas follow oats; in which cafe they fallow only every fourth year; but where land receives no other affiftance than what arifes from fallow, it is a bad practice not to fallow every third year. It is the general practice to plough but once for oats; and therefore it fhall be ftated fo; but it is a much better practice to plough the wheat ftubble once before winter, and again in the fpring.

An eftimate of expence upon an acre of oats.

	l.	s.	d.
To ploughing once	0	10	4
To feed oats, 2 barrels	0	12	0
To harrowing 4 s. 6 d. feed-man 4 d.	0	4	10
To one year's rent	0	18	0
	2	5	2

Thefe two crops confume three years; after which the farmer is to begin again, and to incur every article of expence ftated in the above accounts, in order to obtain two crops more.

* An Irifh acre contains 7840 fquare yards.

An Eftimate of Expence upon a Plantation Acre of Wheat in the Drill Hufbandry, the firft Year.

	l.	s.	d.	
To ploughing 4 times, to prepare the fallow	2	1	4	This is the fame charge as in preparing for the common hufbandry.
To harrowing twice for ditto	0	9	0	This is the fame alfo.
To rent for the year of fallow	0	18	0	This charge is faved after the firft year.
To harrowing with the drill harrows	0	0	6½	Four acres a day may be harrowed with one horfe.
To fowing with the drill plough	0	1	1	From three to five acres may be fown in a day.
To feed wheat generally 5 ftone, but fuppofe 6	0	6	0	
To the firft, or winter hoeing	0	1	7	Two acres may be hoed in a day, two horfes, plough-man and driver: the defign of this hoeing is to leave the plants dry, and to meliorate the earth.
To the fpring hoeing with the cultivator	0	1	1	To deepen the foil, one horfe, plough-man, and driver.
To the third hoeing, i. e. to return the meliorated earth to the corn	0	1	7	To make the corn tiller, i. e. to increafe its branches.
To the fourth and final hoeing	0	1	1	To fill the grain, and render it large.
To rent, the year the corn is growing	0	18	0	
	4	19	3½	

☞ Although the drill culture for the firft year is very near as expenfive as the common, yet after taking the crop, the expence and labour of fallow, and the lofs of time, is not to be incurred again, as is unavoidable in the common hufbandry.

An Eſtimate of Expence upon an Acre of Drilled-Wheat after the firſt crop.

	l.	s.	d.	
To ploughing the land once —	0	10	4	One ploughing is all that is neceſſary.
To harrowing with the drill harrow —	0	0	6½	
To ſowing with the drill-plough —	0	1	1	
To ſeed-wheat — —	0	6	0	Be it remembered, five ſtone is enough.
	0	17	11½	
To four times horſe-hoeing, as before ſtated	0	5	4	
To one year's rent — —	0	18	0	
	2	1	3½	

Thus the land is ſown again with wheat every year, and inſtead of 4 l. 9 s. which is the farmer's expence in the common huſbandry, excluſive of one year's rent of the land: in the drill method it is no more than 17 s. 11½ d. and the total expence, inſtead of 5 l. 7 s. is no more than 2 l. 1 s. 3½ d. rent included; whereby there is a ſaving of 3 l. 5 s. 8½ d. an acre.

Before the account of profit and loſs upon theſe different methods of culture be ſtated, it will be neceſſary to take notice of an objection, which may perhaps be made to the above charge of ploughing in the common huſbandry.

It is pretended, that three quarters of an acre may be ploughed in a day, with one plough: but can it be done effectually? The land may, indeed, be ſcratched, but cannot really be ploughed as it ought to be.

The farmer ought to be cautioned againſt a trick too frequently practiſed in ploughing.

When a ploughman enters his plough and paſſes acroſs the field, he turns a ſod about a foot broad; when he is to return, he enters his plough about four feet diſtant from the outſide of the former furrow, and ſo turns another ſod of the ſame breadth, which, when turned, juſt meets the former ſod; thus four feet of the land appear to be ploughed, whereas the fact is, that the two feet lying under the ſods is not touched with the plough at all.

This deception, added to the practice of juſt ſkimming the ground, enables hirelings to undertake ploughing at ſix and ſeven ſhillings an acre.

But if a plantation acre of land be well and effectually ploughed, ten ſhillings and four-pence as charged above, will not appear too much; and it is, in fact, ſupported by the common courſe of buſineſs.

When wheat is to be ſown, it is the general cuſtom to ſend a barrel of ſeed into the field with two ploughs, which is to ſow an acre of land, and that is the uſual day's work for two ploughs in the general courſe of buſineſs.

Let us ſee then, what the expence will amount to: eight cattle will be eight ſhillings, two ploughmen one ſhilling and four-pence; two drivers one ſhilling, and the ſeed-man eight-pence, which in all makes eleven ſhillings, and correſponds with the above charge.

One Acre of Wheat and Oats in the Common Huſbandry, for fifteen Years.

Dr.	l.	s.	d.	*Per Contra*, Cr.	l.	s.	d.
To the expence on a wheat crop, 2d year	5	7	0	By the produce of wheat, 9 barrels, at 20s.	9	0	0
To the expence on an oat crop, 3d year	2	5	2	By the produce of oats, 14 — at 6s.	4	4	0
To the expence on a wheat crop, 5th year	5	7	0	By the produce of wheat, 9 — at 20s.	9	0	0
To the expence on an oat crop, 6th year	2	5	2	By the produce of oats, 14 — at 6s.	4	4	0
To the expence on a wheat crop, 8th year	5	7	0	By the produce of wheat, 9 — at 20s.	9	0	0
To the expence on an oat crop, 9th year	2	5	2	By the produce of oats, 14 — at 6s.	4	4	0
To the expence on a wheat crop, 11th year	5	7	0	By the produce of wheat, 9 — at 20s.	9	0	0
To the expence on an oat crop, 12th year	2	5	2	By the produce of oats, 14 — at 6s.	4	4	0
To the expence on a wheat crop, 14th year	5	7	0	By the produce of wheat, 9 — at 20s.	9	0	0
To the expence on an oat crop, 15th year	2	5	2	By the produce of oats, 14 — at 6s.	4	4	0
	38	0	10		66	0	0
To clear profit in fifteen years —	27	19	0				
	66	0	0				

One Acre of Drilled-Wheat, for fifteen Years.

Dr.	l.	s.	d.	*Per Contra*, Cr.	l.	s.	d.
To the 1ſt and 2d year's expence —	4	19	3½	By the produce of wheat, 2d year, 6 barrels	6	0	0
To the — 3d year's expence —	2	1	3½	By the produce of ditto, 3d year, 6 —	6	0	0
To the — 4th year's expence —	2	1	3½	By the produce of ditto, 4th year, 6 —	6	0	0
To the — 5th year's expence —	2	1	3½	By the produce of ditto, 5th year, 6 —	6	0	0
To the — 6th year's expence —	2	1	3½	By the produce of ditto, 6th year, 6 —	6	0	0
To the — 7th year's expence —	2	1	3½	By the produce of ditto, 7th year, 6 —	6	0	0
To the — 8th year's expence —	2	1	3½	By the produce of ditto, 8th year, 6 —	6	0	0
To the — 9th year's expence —	2	1	3½	By the produce of ditto, 9th year, 6 —	6	0	0
To the — 10th year's expence —	2	1	3½	By the produce of ditto, 10th year, 6 —	6	0	0
To the — 11th year's expence —	2	1	3½	By the produce of ditto, 11th year, 6 —	6	0	0
To the — 12th year's expence —	2	1	3½	By the produce of ditto, 12th year, 6 —	6	0	0
To the — 13th year's expence —	2	1	3½	By the produce of ditto, 13th year, 6 —	6	0	0
To the — 14th year's expence —	2	1	3½	By the produce of ditto, 14th year, 6 —	6	0	0
To the — 15th year's expence —	2	1	3½	By the produce of ditto, 15th year, 6 —	6	0	0
	31	16	1		84	0	0
To clear profit in fifteen years —	52	3	11				
	84	0	0				

	l.	s.	d.
To clear profit ariſing upon an acre of land in fifteen years in the Drill-Huſbandry —	52	3	11
To clear profit ariſing upon an acre of land in fifteen years in the common huſbandry —	27	19	2
Greater profit on the drilled acre in fifteen years — — —	24	4	9

Which amounts to 1l. 12s. 3¼d. *per annum*, for fifteen years on the acre, more than by the common huſbandry.

In

In the drill-hufbandry the crops are ftated at three barrels of wheat lefs upon an acre than in the common hufbandry, that it may not be fuppofed to be over-rated; but in the common hufbandry, the crops are rated at the higheft; fourteen barrels of oats an acre, are alfo allowed in the common hufbandry, which every farmer muft admit to be great allowance upon the general produce.

That the drill culture will produce fix barrels an acre, is fully proved in Mr. Baker's report at large, which will fhortly be publifhed, where it will be fhewn, that much more has been produced.

Doubtlefs it will be obferved, that in fifteen years fourteen wheat crops are obtained in the drill-hufbandry; in the common hufbandry only five wheat and five oat crops; the five other years are not only loft, but are an heavy expence to the farmer.

A farmer having forty acres of tillage, fuppofing him to direct his attention to bringing it to the drill culture, would make in fifteen years 969 l. 10 s. more than he can in the common hufbandry: which is fuch an advantage, that the greater profit in the drilled acre in fifteen years will purchafe the fee fimple of that in the common hufbandry, at twenty-feven years purchafe, valuing the land eighteen fhillings an acre.

Thus it appears, that in every fifteen years the fee fimple of all the tillage lands of the kingdom, is loft to the community by the common courfe of tillage.

In ftating thefe accounts, no mention is made of fences, water cutting the land, weeding and reaping, as thefe articles of expence depend upon a variety of circumftances: but will, in general, be more upon the common hufbandry than the drill.

We fhall conclude this article with the following experiments made by that accurate and intelligent hufbandman M. de Chateauvieux.

Experiments made in the Year 1751, *by* M. Lullin de Chateauvieux, *firft Syndic of the City and Republic of* Geneva.

"In October 1750, fays M. de Chateauvieux, I began my experiments on a fpot of ground, of a rich ftrong foil, one hundred and fixty feet long and forty-two feet wide. Not being then provided with proper inftruments for the horfe-hoeing hufbandry, I ordered it to be dug with the fpade, and laid it out in feven beds of equal fize. Great care was taken to break the clods thoroughly, and to dig the earth very deep. The beds, which were in a loofe ftate, were raifed high in the middle.

"On the fourteenth of October, I fowed three of thefe beds with wheat, two with barley, and two with oats. I muft obferve that, in this country, it would have been better to have fowed a fortnight earlier.

"I made three furrows in each bed, fo fhallow, that the feed was not buried above half an inch deep. The wheat was dropped by hand in fingle grains, at the diftance of fix inches from each other. The barley was dropped at the diftance of nine inches, becaufe it branches more than wheat. Though oats branch more than either, yet, as they are a tender plant, and apt to be killed by the winter's cold, I fowed them at the diftance of three inches one grain from another.

"I ufed 2880 grains of wheat, weighing three ounces fifteen penny-weights, to fow the three beds. In one of the beds of barley I fowed four rows. I employed 1491 grains, weighing two ounces, in the fowing of two beds; and four ounces of oats were fufficient to fow the two other beds. I neglected to count the grains of the oats.

"Thefe feeds came up very well, and though they grew but little before winter, yet fome of them put forth their fecond blade. They foon fuftained a confiderable lofs. Numbers of fmall fnails eat many of the plants clofe to the earth. I judged it neceffary to fupply this lofs by fowing frefh feed.

"The winter was very unfavourable to corn. We had almoft continual rains, with little fnow or froft. The corn in general fuffered greatly, and the crops were very inconfiderable in this country.

"Early in the fpring, thefe plants made ftrong fhoots, and had much the better of the corn in the common way. Their blades were very large, and of a deep green, and the number of ftalks increafed greatly. The alleys were hoed in good time, and the advantage refulting from this operation was very manifeft. I vifited my plants towards the latter end of April, and found their numbers greatly diminifhed. The mifchief which the fnails had done them was almoft the only caufe. The inclemency of the winter likewife deftroyed fome: fo that I found I had loft 1068 plants of wheat, and had but 1812 remaining. My plants of barley fell fhort by 412, their number being reduced to 1079. The winter deftroyed fo many plants of the oats, that very few were left.

"From this time, all the plants grew exceedingly: they branched fo much, that, as far as I could judge, every plant of wheat, taking them one with another, produced twenty-eight ftalks, the barley above forty, and the oats ftill more. Each plant formed a large tuft, fome of fixty, eighty, and above a third part of the plants of about 150 ftalks: fo that, though they were at firft at a great diftance from each other, in June and July they entirely covered the furface of the alleys. All thefe fpindled, and produced, each in its kind, very long and large ears, full of grain from end to end. They ripened kindly, but had not yet got over all their mifchances. Thefe fine ears became a prey to birds, which could not be kept off. This is an inconvenience to which all fmall experiments are liable. That I might fave fomething, I was obliged to cut my corn down before it was quite ripe. But before I did that, I examined perfonally, with all poffible care, what might be the amount of the lofs which I had fuftained by the birds: and befides this, I fent for four farmers, in quality of appraifers, to eftimate the damage. They all agreed, that it was above half the crop, and affured me I fhould not miftake if I reckoned it as fuch. I had formed the fame judgment myfelf. We found the lofs fomewhat lefs confiderable in the barley. As to the oats, it could not be fo well afcertained; but we believed it could not be lefs than a third part of the crop.

"While the wheat ripened, I difcovered that fome of the plants were blighted. All thefe, whether blighted totally or only in part, were plucked up by my direction, before I cut down the reft of the crop. They amounted to 297; fo that I was reduced to 1515 plants, the feed of which, after deducting that which produced the 297 blighted plants, is reduced to two ounces and fix penny-weights. The 1515 plants were the whole produce of the crop, and thefe yielded fifty-five pounds of eighteen ounces to the pound. But the fame ground and plants produced likewife what was eaten by the birds; for which it is but juft to make an allowance. The whole produce will then have been in reality 110 pounds, which to me feemed very confiderable.

"I made another enquiry, which I judged to be of fome importance: this was, to know whether the number of the fineft and largeft ears, was greater than that of the middling and fmalleft. I examined them with the utmoft attention, and found almoft all the ears of equal beauty; at leaft nineteen out of twenty, I am confident, were fo.

"I was likewife willing to know what number of grains might be contained in each ear. To this end, without regarding the proportion I had found between the number of the fineft ears and that of the fmalleft, I took twelve middle fized ears, twelve of the fmalleft, and twelve of the fineft.

"The twelve middling ears contained one with another thirty-feven grains;

"The twelve fmalleft ears, thirty grains; and

"The twelve fineft ears, fifty grains apiece.

"The 1079 plants of barley, produced feventy-five pounds of eighteen ounces to the pound. What was eaten by the birds fhould likewife be added here.

"My oats produced one hundred and three pounds of eighteen ounces, exclufive of what was deftroyed by the birds.

"This little experiment fhews, that the new hufbandry will be equally profitable for all forts of grain.

Obfervations on the foregoing Experiment, by M. De Chateauvieux.

"The quantity of wheat gathered from the three beds, feems to me as great as could be expected. Though I had

had but fifty-five pounds, yet adding thereto the fifty-five eaten by the birds, this little spot yielded one hundred and ten pounds. In large fields we are not so sensible of what the birds destroy.

"If we likewise take into this account, the 1068 plants destroyed by the snails, and the 297 blighted plants, making together 1365, these would have yielded 100 pounds of wheat, and the whole crop would have been 210 pounds; for it cannot be doubted but they would have yielded in the same proportion as the 1515. What proves it is, that in a space about thirty feet long, at the end of the beds, which escaped the snails, very few plants failed; and the rest were very thriving, and branched greatly; so that it is evident, the whole ground could easily have nourished all the plants that were intended to grow on it, and which were at the distance of six inches from each other. I make this remark, in order ro shew what may be expected from the following experiments, it being an easy matter to sow the ground so as to have the desired number of plants.

"I suppose then, and I think justly, that this small spot of ground can produce 210 pounds of wheat at one crop: but the inestimable advantage of the new husbandry is, that it keeps the earth in a state fit for sowing every year; so that in two years it can yield 420 pounds; whereas, in the common husbandry of this country, the farmer can have but one crop in that time, being obliged to sow his land only every second year; and that one crop will fall greatly short of the two which the new husbandry will produce. A vast advantage in favour of this last.

"Without being too partial to the new husbandry, we may expect that the second and following crops will be more plentiful, the earth being in finer tilth. Accordingly, the wheat with which I have sowed these three beds a second time, is already visibly benefited by the looser state of the mould, which was so frequently stirred in the summer. I have provided against the accidents which destroyed so many of my plants, by sowing thicker. Instead of three ounces, fifteen penny weights of wheat, which I sowed last year, I have now sowed nine ounces, and twelve penny-weights; and though the snails have again eaten many of the plants this year, close to the ground, a sufficient number still remains, by means of the additional seed, to fill the beds, and they are equally distributed.

"I shall now compare the crop I have been speaking of, with that of the experiment which I made on the same spot of ground in the year 1729, in order to see whether I could not obtain a more plentiful return, by sowing thinner than is usually practised. The ground was ploughed and sowed in the common way. I employed six pounds of wheat to sow it, being somewhat less than half the usual quantity. The plants looked extremely well during the whole time of their growth, and produced above double the quantity that wheat did in the common fields. They yielded me 105 pounds of wheat. Even in this way I could have but one crop in two years: and it appears that I have not exaggerated the produce of the new husbandry, in making it 420 pounds in the same space of time, which is a clear gain of 315 pounds.

"I afterwards tried some other experiments; one of which, made in the year 1746, I must now mention. I tried two things at the same time: first, whether wheat would grow after it had been kept several years; and, secondly, whether sowing each grain at six inches distance, would turn to account. As I did not intend to make the experiment on a large field, I chose for it a spot of strong earth, in bad condition, fit for making bricks. I sowed in it three quarters of an ounce of wheat, which I had preserved carefully for eight years. It rose pretty well; but about one fourth of the grains did not sprout at all. After the winter, these plants grew very strong. I delayed seeing them too long, for I found them quite choaked with weeds. I sent a woman to weed them, who, unluckily, at the same time pulled up almost all the plants of wheat: the finest suffered most, she not imagining that they could be wheat. There were but about forty plants left, and those at very great and unequal distances. These produced tufts of upwards of fifty stalks, with ears five or six inches long, containing a great deal of grain, which became the prey of birds. This experiment, if it answered no other end, is at least a proof of the goodness of the new husbandry.

"The good success of these little experiments, was a strong inducement to me to make more considerable ones: but in order to this, it was necessary to be provided with a proper hoe and drill-plough; for I must confess, that Mr. Tull's did not appear to me to be such. Its great fault is, that it is too complex.

"Being provided with a proper hoe-plough, I soon became sensible of the advantages of it. Numbers of such ploughs are already used in this country; and, which is saying a great deal, even our farmers make use of them.

"This is the plough which I used all this summer in preparing my ground. It did admirably well in the alleys of my experiment, after the corn was above four feet high. No plant was hurt by it, and I could bring the plough as near to them as I pleased. Thus it fully and conveniently performs this hoeing, in which I have seldom used more than one horse. I have likewise prepared with it the ground sowed with wheat this autumn.

"My new hoe and drill-plough have made it easy for me to enlarge my experiments this year. However, I thought it most adviseable to proceed by degrees; and have therefore restricted myself to the culture of about ten acres, according to the new husbandry, part of which is in a very strong soil, part in a very light soil, and part in a middling and stony soil.

"What I have had chiefly in view in my experiments this year is, "to know exactly what quantity of seed will produce the most plentiful crop." To this end, I have sowed wheat in different degrees of thickness, dropping the grains some at one inch, and some at two, and so on, to the distance of six inches from each other.

"All this wheat has at present a fine appearance, and the plants are infinitely stronger than those in the common fields: their blades are much larger, and of a very deep green colour. What is more, they have already branched, and promise a great number of stalks. I have counted on some plants twenty, and on others twenty-five. Upon the whole, there is great reason to expect a plentiful crop.

"I have made another experiment with the drill-plough, with which I have sowed some of my common fields. Instead of distributing the seed by hand, in the broadcast way, as in the old husbandry, I have sowed the whole field with this instrument, without leaving any alleys. This has saved a great deal of seed, having employed only twelve pounds of eighteen ounces, to sow the same extent of ground as used to be sowed with 110 pounds. Yet I think this sufficiently thick: the plants are very fine, and of a deep green. They have already begun to branch, and promise many stalks. Hitherto my wheat gives me reason to be pleased with the experiment I am making. I have sowed about thirty acres in this manner."

Experiments made by M. Lullin de Chateauvieux, *in the Year* 1752.

"My experiments this year are of three kinds. The first was made on the same spot as the last year's experiment: the second, on a piece of ground which was made into beds for the first time; and the third, on a field ploughed in broad lands in the common way, but sowed with the drill-plough, in equally distant rows, without any intermediate alleys.

First Experiment, Numb. I.

"I have already mentioned, that this spot was sowed with wheat, the beds being now made in the middle of the former alleys. The summer hoeings had brought this ground to so fine and loose a state, that, after one ploughing, I sowed the three beds with the drill-plough, on the twenty-fifth of September; and to prevent the accidents I before met with, I increased the quantity of seed to nine ounces fifteen penny-weights.

"The wheat rose extremely well, and the rows were full of plants, which became very strong and thriving before the winter. Though snails destroyed a great number

ber of them, as they had done the year before, yet I judged the rows sufficiently stored with plants, and thought that this accident would do no great damage to the crop.

" The winter was pretty favourable to corn in general. My plants made very strong shoots in the spring; but I found some chasms in the rows which I had not perceived in the autumn. I imputed this in some measure to the inclemency of the winter, which had undoubtedly destroyed several weak plants. These chasms were but few, and the worst of them had about two plants in fifteen inches.

" I horse-hoed the alleys for the first time on the ninth of March, and a second time on the twenty-fifth of May. The ground was in so loose a state, that I thought it needless to hoe it afterwards, especially as the wheat was in an exceeding good way. It continued of a very deep green till it ripened; the blades were extremely large; and the plants branched much more than they had done the year before. It was a common thing to find plants with between sixty and seventy stalks, which, in general, grew to above five feet and some inches high, and were crowned with large ears quite full of grain.

" As soon as the wheat had done blossoming, I found it necessary to defend it against the birds. Thanks to the care that was now taken, they did it less hurt this year than the last: but still they eat a great deal of it, though I cannot precisely determine the quantity.

" As soon as the wheat appeared to be near ripe, in order to preserve it from the farther plunder of those robbers, I reaped it, on the twentieth of July, though I would rather have chosen to let it stand five or six days longer. It remained in the field four days, to dry, and was threshed towards the latter end of August. It yielded an hundred and forty-two pounds of wheat, at eighteen ounces to the pound.

" This wheat was very fine, perfectly clean, and the grain much larger than in the common way.

" This experiment gives just rise to the following remarks:

" First, The earth of these three beds having been pulverized and brought to a very loose state by the horse-hoeings in 1751, the plants were stronger, and more thriving than those of the year before; a circumstance which contributed to the increase of the crop.

" Secondly, This crop justifies my estimate, that this spot of ground could yield 210 pounds of wheat in one season, if cultivated according the principles of the New Husbandry: for if we add to the 142 pounds reaped this year, the loss occasioned by the birds and snails, it is pretty evident that the whole produce would have nearly amounted to 210 pounds.

" Luckily, that I might be more thoroughly satisfied what loss I suffered by the birds, I counted in two different places how many stalks the plants in the three rows had yielded. On a length of ten feet, I found 1600 in one place, and 2030 in another. As I would always avoid over-straining my calculations, I shall only suppose that every ten feet in length produces 1600 stalks: the beds, being 160 feet long, will consequently contain at least 25600 stalks, and the three beds together 76800 stalks, or ears.

" To know, in the next place, how many pounds of wheat might be contained in that number of ears, I had as many of them threshed, a month after harvest, as yielded a pound of eighteen ounces. They were taken at random, without culling them, out of a sheaf which seemed to have been but little damaged by the birds.

" Three hundred and sixty ears yielded those eighteen ounces of wheat: so that, dividing 76800, the whole number of ears, by 360, the produce of the crop would be 213 pounds six ounces, at eighteen ounces to the pound, or 240 pounds of sixteen ounces. Hence it appears, that my first estimate was pretty just, and that the produce may be even more considerable hereafter.

" Thirdly, This spot was clear of weeds; though it used to be over-run with them. It appears by this, that the New Husbandry destroys them effectually; though this advantage will be less felt the first year, than in other subsequent years.

" From the observation which I made, that the plants were in a more thriving state this year, than in 1751, it follows, that the earth, far from having been exhausted by the nourishment it had yielded the plants during that year, became more fruitful in this: which can be imputed only to the new culture; the land having received no other assistance, either by dung or manure.

" The wheat was this year, upon a very exact search, free from smut or blight. I found but one blighted ear, though there were numbers of such in the fields contiguous to mine. I cannot however impute this favourable circumstance to the new culture alone: it may have contributed thereto, and may lessen the quantity; but to be sure of that requires the experience of some years."

EXPERIMENT, Numb. II.

" This experiment was made on a larger piece of ground, formed into beds six feet wide. The distance from the middle of one bed to the middle of the next, was also six feet; and the whole extent of the spot was about an acre and a quarter. Each bed was sowed with three rows of wheat.

" The small quantity of seed with which this ground was sowed, certainly required that every grain should grow: but the intended number of plants fell greatly short, several of the grains not rising at all, and many of those which did rise, being destroyed by insects. The greatest damage was done by snails. There were great chasms in the rows, without any plants. As far as I could judge, between a third and fourth part of the rows did not produce any thing.

" The hoeings were performed this year at proper seasons, and rather more frequently to make up for the neglect of the former year: for the ground was not in sufficiently fine tilth when the wheat was sowed.

" On the fourteenth and fifteenth of October 1751, the alleys were ploughed for the first time before winter.

" On the ninth and tenth of March 1752, they were ploughed again for the first time after winter.

" From the eighteenth to the twenty-fourth of April, the ground was weeded.

" On the twenty-ninth of April, the alleys were stirred with the cultivator; which was again repeated on the twenty-fifth of May and the seventh of June.

" This wheat made a fine appearance; the length of the stalks, and the largeness of the ears, shewed how much the new culture promoted the growth of these plants, which branched nearly as much as those of Num. I. This field was reaped on the twenty-fifth of July.

" I shall join to the account of what this crop produced, an estimate of what might have been expected if the same ground had been cultivated in the common way."

Comparison of the Produce of the same Field, cultivated according to the Old, and according to the New Husbandry.

" This field, which is of a very good and strong soil, was very badly ploughed last year by reason of the frequent and heavy rains, and had not been dunged for several years. In the common way, it used to be sowed with 318 pounds of wheat. This year, it was made into beds six feet wide, and was sowed on the twenty-fifth of September, with only ten pounds of wheat.

Produce of this field under the new culture in 1752.

" This field, laid out in beds, produced, of very fine large grained wheat		926 lb.
To be deducted.		
" Though this wheat was very clean, yet four parts in a hundred were sifted from it, as small corn; valued at — — — —	37 lb.	47 lb.
" For the seed sown — —	10 lb.	
Neat produce -		879 lb.

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" In this huſbandry, the ſame field is ſowed every year; ſo that, ſuppoſing the crop of 1753 to be only equal to this of 1752, (and there is no doubt but it will be greater) it will again produce — — — — —	879 lb.
Amount of the two crops —	1758 lb.

Produce of the old Culture.

" If we judge of it by the beſt crops of former years, it will be three times the quantity of the ſeed, viz. — — — — — —	954 lb.

To be deducted.

" Loſs by ſifting, fifteen per cent. It has often been twenty-five and thirty per cent. and even more. Every time this field was ſowed, the corn was lodged, which prevented the ears from filling, and rendered the grains ſmall and ſhrivelled — — —	143 lb.	461 lb.
For the ſeed — — — —	318 lb.	
Neat produce —		493 lb.
" Conſequently the balance, in favour of the New Huſbandry, is — — — —		386 lb.
		879 lb.

" As this field yields but one crop in two years, in the common huſbandry, it would produce in that ſpace only — — — —	493 lb.
" From whence it follows, that the neat profit of the new culture in the ſame ſpace of time, exceeds the other by — — — —	1265 lb.
	1758 lb.

" Suppoſing this field never to produce a greater crop than that of this year, it is evident that it is beſt to follow the new method. But we can already promiſe, that the ſucceeding crops will be more plentiful. The field is now ſown in the new way; it has not yet ſuffered any damage by inſects; and the rows are well ſtored with plants, whoſe more thriving ſtate promiſes a better crop than that of the laſt year.

" It may perhaps be thought odd, that I ſhould limit the produce of the field ſowed in the common way, to three times the ſeed. I know there are lands in this country which yield more, viz. four or five times the ſeed, and ſometimes upwards: but then it muſt be granted, that there are but few ſuch lands; and that they are fields in extraordinary fine tilth, and enriched with manure. I therefore ſpeak of our lands in general, taking good and bad together. In this caſe, I ſay, the produce, one year with another, will not exceed three for one.

" My fields have always been as well cultivated as any in the country. I have computed the amount of my crops for ſixteen years running, viz. from 1730 to 1745, incluſively. Theſe accounts were carefully kept by a ſteward who died a few years ago, and I do not find that the produce ever was greater than what I have been ſaying, one year with another."

Experiment, Numb. III.

" About an acre and ſeventeen poles of ground, in another field, was laid out in beds like the former. This land, which is very ſtrong, was but in bad tilth, notwithſtanding the care I took to break the earth thoroughly, and reduce it into ſmall particles. Frequent rains were the cauſe of this. It was ſowed with the drill-plough on the twenty-fourth of September. Only ſeven pounds of wheat were uſed. The plants roſe pretty well: but towards the end of autumn, they were deſtroyed daily by inſects, and thereby reduced to a very ſmall number, which greatly diminiſhed the crop.

" On the ſixteenth of October 1751, the alleys were ploughed for the firſt time before winter.

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" On the tenth and eleventh of March 1752, they received their firſt ploughing after winter.

" On the firſt of May the ground was weeded.

" On the twenty-third of May the alleys received their ſecond ſtirring with the cultivator, and on the twelfth of June they were ploughed.

" The plants which came up were very fine, and branched greatly: the ears were like thoſe of the experiments I have already mentioned, and the grain equally large. Though the produce was but 392 pounds, yet it is a fine crop for the ſmall number of plants that eſcaped unhurt.

" As I know the cauſes to which the ſcantineſs of this crop was owing, I make no doubt but it will equal that of any of the other fields next year. It is now ſowed for the ſecond time in the new way. The rows are well ſtored with plants, and the corn is in as good condition as can be deſired."

Experiment, Numb. IV.

" This experiment was made at the diſtance of ſix miles from my houſe, on a light poor ſoil, which induced me to dung it. The beds were about ſix feet wide, and were ſowed on the twenty-firſt of September with three pounds and three quarters of wheat, which produced fine plants and large ears, and yielded 196 pounds. Though the earth had not been well ſtirred, nor at proper ſeaſons, yet the corn ſowed in it produced greatly. The dung undoubtedly helped to make up for the want of due culture."

Experiments

Made on Fields ſown in equally diſtant Rows with the Drill-Plough.

Numb. V.

" I have ſowed fields cultivated in every reſpect in the common way, except in the manner of diſtributing the ſeed, which was done with the drill-plough. The whole field was covered with rows of wheat, diſtant from each other ſeven inches and a half.

" The advantages which I propoſed to myſelf by ſowing in this manner, were, firſt, the ſaving of ſeed, and preventing the earth from being over-ſtocked with plants; ſecondly, burying the ſeed at a proper depth; thirdly, having the plants at equal diſtances: and, laſtly, the little ſtirring of the ground, and breaking of the clods, which the drill-plough effects at the ſame time that it ſows. Theſe things ſeemed to me more likely to be attended with ſucceſs than the common way of ſowing.

" The plants of this wheat were very fine; their deep green colour ſhewed their ſtrength: the largeneſs of their blades, and the number of their ſtalks, ſhewed likewiſe that they found greater plenty of nouriſhment than wheat in the common way. The plants had in general four, ſix, eight, ten, or more ſtalks; ſo that theſe fields, which, till the month of April, ſeemed ſcarcely to have been ſown, changed then ſo as hardly to be known again, by the number of ſtalks which ſhot forth at that time. The wheat was taller than that in the common way, and the ears larger and better filled with grain.

" An account of the produce will ſhew what may be expected from this manner of ſowing.

" *Account of the Produce of the ſame Field ſowed Part in the old Way, and Part with the Drill plough, on the fourteenth, fifteenth, and ſixteenth of September*, 1751.

" The whole of this field uſed commonly to be ſowed with twenty meaſures of wheat, each meaſure containing 106 pounds of eighteen ounces. Three meaſures, or 318 pounds of wheat, were ſown in the uſual way in the richeſt part of the field. The remaining part, which would have required 1802 pounds in the common way, was ſowed with the drill-plough with only 265 pounds.

" The ſoil was middling, neither too ſtrong nor too light, and pretty ſtony. The land was poor, becauſe it had not been dunged, which indeed it ſeldom was, the owner not having more than was neceſſary for his vines.

Produce

Produce of the new huſbandry.

The 265 pounds of wheat produced		5450 lb.
To be deducted.		
For ſmall and bad grain ſifted out, 4 per cent.	218	483 lb.
For the ſeed	265	
Neat produce		4967 lb.

" If the other part of the field, which was ſowed with the three meaſures in the old way, had been ſown with the drill-plough, it would have yielded	960 lb.

To be deducted.		
Loſs by ſifting, 4 per cent.	38 lb.	84 lb
For the ſeed	46 lb.	
Neat produce to be added to the above		876 lb.
Neat produce of the whole		5843 lb.

Produce of the old huſbandry.

" That part of the field which was ſowed with the three meaſures of 106 pounds each, produced thrice the quantity of the ſeed, mixed with bad grain. The ſame meaſure of this grain weighed but 103 pounds. This field yields no more even in the beſt years. If the whole of it had been ſowed in the old way, it would have produced 6180 lb.

To be deducted.		
Loſs by ſifting, 15 per cent. It has often been 25 and 30 per cent.	927 lb.	3047 lb.
For the ſeed	2120 lb.	
Neat produce - - - -		3133 lb.
Balance in favour of the new method		2710 lb.
		5843 lb.

Experiment, Numb. VI.

" I ſowed, continues M. de Chateauvieux, another field of about three roods and fifteen poles in the ſame manner, with thirty pounds of wheat, reckoning 18 ounces to the pound, on the twenty-fourth of September. The ſoil was ſtrong, and in fine tilth. The wheat grew in every reſpect like that of the preceding article, with this only perceptible difference, that the ſtraw was ſomewhat longer, and the ears larger. It was not threſhed till the beginning of December, and yielded 809 pounds of very fine wheat (the pound 18 ounces.) The produce of this field was greater than that of the former, in proportion to the quantity of ſeed. But the ſoil of this was better, and in finer tilth."

Experiment, Numb. VII.

" This experiment was made about three miles from me, on a piece of ground of the extent of about two roods and twenty-ſeven poles. This land is neither too ſtrong nor too light, and may be called a pretty rich ſoil. It was ploughed three times, like other lands, and had not been dunged for many years. It uſed to be ſowed with 165, or 170 pounds of wheat. It was now ſowed on the fifth of October with only twenty-four pounds. Though the ſeaſon was ſo far advanced, this ſeed came up pretty well before winter. The plants throve greatly in the ſpring, and the field became covered with ſtrong ſtalks, and very large ears, full of fine plump grain.

" The crop yielded 800 pounds of clean wheat, without mixture of any other ſeeds. Deducting from this the twenty-four pounds of ſeed, the neat produce is 776 pounds. This field, when ſowed in the common way, produces in the beſt years about 875 pounds, from which if we deduct 165 pounds for the ſeed, the neat produce will be 710 pounds. Thus we ſee that the ſame ground ſowed with the drill-plough, produced 66 pounds more than when ſown in the common way. But as wheat raiſed in this laſt way is always mixed with abundance of ſeeds of weeds, which muſt be ſeparated by ſifting, an allowance muſt likewiſe be made for that; and the profit will then not be limited to the 66 pounds only, which the owner reaped more than in the common way.

" I omit ſeveral experiments of wheat ſowed in beds, and with the drill-plough, in equally diſtant rows, the ſucceſs of which has been nearly equal to that of thoſe I have already ſpoken of. I ſhall mention only one more, and that on account of a circumſtance which deſerves to be known. I made it on a light ſoil, the worſt I knew of, full of pretty large ſtones, and which had not been dunged in the memory of man. The ſtones did not hinder the drill-plough from dropping the ſeeds very gradually. I choſe this bad ſoil on purpoſe to ſee how wheat would thrive in it. I allowed too little ſeed, conſidering the badneſs of the ground. The ſtones prevented many plants from riſing, and many more were deſtroyed by inſects; ſo that the corn was very thin, and the crop ſmall. I was however pleaſed with it, becauſe I found the plants grew almoſt as ſtrong as in a good ſoil, and the ears were as large, and as full of grain.

" A little before harveſt, the wheat of all theſe experiments ſuſtained many heavy rains, accompanied with very high winds; and though the ſtraw was much longer than that of the wheat which had been ſowed in the common way, the corn was not lodged, whilſt a great deal was laid flat in the neighbouring fields. Some indeed was bent, but that is different from being lodged. This laſt ſituation is very hurtful to the filling of the grain; but its being bent is attended with no inconvenience. I am even inclined to think that it may be of ſervice to the wheat not to remain in a perpendicular direction, and I intend next year to be particularly attentive to this.

" It is not at all to be wondered at, that plants ſown in the common way ſhould not thrive ſo well as theſe which grow in beds. The former, not having been aſſiſted by the ſtirring of the mould, cannot draw ſo much nouriſhment from the earth as thoſe in beds. The ſize of theſe laſt has indeed exceeded my expectation. There is reaſon to be ſatisfied with this manner of ſowing, even if it were attended with no greater advantage than this year's crops afforded. But if the quantity of ſeed is increaſed, ſo that the field be ſtocked with as many plants as it can nouriſh, the profit will be ſo much the more conſiderable.

" It is time to return to our experiments on fields laid out in beds, which are the more immediate object of the new huſbandry.

" Thoſe which I have made this year have not brought the produce of the new culture to near what it will be hereafter, as will appear from what I ſhall next obſerve."

Reflections of M. de Chateauvieux, which prove the Truth of the Principles on which the New Huſbandry is founded.

" We ſee by the experiment, Numb. I. that the earth, by being in a looſer or more divided ſtate the ſecond year, is fitter to afford a greater quantity of nouriſhment to plants, whoſe productions will always be proportioned to the eaſe with which they can reach that nouriſhment.

" I was in hopes that the experiments of this year would have enabled me to determine what quantity of ſeed it is beſt to ſow, in order to obtain the greateſt crop. The lands on which I ſowed the moſt ſeed laſt year, ſhewed me plainly, that it would be right to increaſe the quantity, in order to provide againſt the accidents by which the plants had been thinned too much.

" But this increaſe of ſeed ſhould be regulated with great diſcretion, regard being had both to the circumſtances of the ſeaſon in which the ſeed is ſowed, and to the condition of the ground in which it is planted. If the ſoil is in very fine tilth, leſs ſeed will be ſufficient.

" The experiments of this year ſhew, that there are but three principal means by which we can obtain the utmoſt

moſt production that plants are capable of affording. Theſe means are practicable only in the new huſbandry; for in that alone each bed has the number of plants it can properly nouriſh, which is the ſource of plenty.

"The firſt means is, to make the plants produce a great number of ſtalks.

"The ſecond is, to make each ſtalk bear a large ear.

"The third is, to make each ear be quite full of plump grain.

"Theſe effects cannot be obtained in the old huſbandry, becauſe they can only be procured by frequently ſtirring the earth.

"All my experiments this year ſhew the truth of this, but eſpecially the experiments Numb. I. and II.

"It is therefore by ſtirring the alleys while the plants are yet young and growing, that we can make them produce a number of ſtalks, cauſe thoſe ſtalks to bear large ears, and fill each ear with large plump grain. But to obtain theſe advantages, it is of great conſequence, that the hoeings be performed at proper ſeaſons, each having its peculiar effects.

"The ploughing before winter, is intended to drain off the water, which, if it ſhould remain long near the plants, would chill and greatly hurt them; and to lay up the earth to be mouldered by the winter's froſt. It is hereby enabled the better to ſupply the plants with their neceſſary food in the ſpring. This may be done at the farmer's conveniency, from the time that the plants have three or four blades, till the froſt ſets in: and even in the winter, if it does not freeze, ploughing will always be of ſervice.

"The firſt ploughing after winter is of great importance. It is to this that we owe the number of ſtalks which the plants produce. That it may have this effect, it muſt be performed as ſoon as the ſevere colds are paſt; and, at lateſt, as ſoon as the plants begin to ſhoot. If it be delayed longer, it will contribute very little towards their branching. It will ſerve only to make the ſtalks grow longer. If any new ones ſhoot out, they will not thrive ſo well as the firſt; and therefore it is of great conſequence that they ſhoot out all together.

"The hoeings which are performed from this time, till the wheat has done bloſſoming, ſtrengthen the plants, lengthen their ſtalks, and enlarge their ears. The ſeaſon of theſe hoeings is not ſo exactly limited as that of the former, and the frequency of them will depend greatly on the ſtate of the ground; for it muſt not be touched when it is too moiſt. If the ſeaſon is kindly, they may be repeated two, three, or four times: but I think one hoeing highly neceſſary juſt before the ears break forth. They certainly grow longer and larger by it.

"The laſt hoeing is the moſt important of all, and that which can leaſt be diſpenſed with. It muſt be performed as ſoon as the bloſſom is gone off the wheat. This fills the whole ear, and ſwells the grain.

"When farmers become ſenſible of the good effects of theſe frequent ſtirrings, they will not neglect to repeat them at proper ſeaſons. It is by a ſucceſſion of them, that, in my opinion, crops may be brought to their higheſt perfection: and if unfavourable ſeaſons prevent their being given at their proper times, a diminution of the crop will moſt aſſuredly enſue.

"No one who conſiders the produce of the ears of corn on lands cultivated according to the New, and the Old Huſbandry, will, I believe, doubt which of theſe is to be preferred. I ſhall beſtow a few moments, to point out the difference which I have found between the one and the other.

"I ſaid before, that 360 ears yielded me eighteen ounces of wheat. Here is a determined fact; and I am certain that I have not enlarged it; becauſe the birds had eaten ſome of the grain; otherwiſe fewer ears would have produced thoſe eighteen ounces.

"When, in the year 1750, I firſt began to inquire into the principles of the New Huſbandry, I judged that t might be of ſome importance to know what is the uſual produce of a plant of wheat when cultivated in the common way. That year was reckoned a very good one for wheat, which appeared clean and good as it ſtood upon the ground. I took this method to come at the knowledge I wanted.

"I took part of a ſheaf which appeared to me very good, and which was the produce of a very rich field. I divided it into three parcels. In the firſt parcel were all the good ears: the middling and ſmall ears were in the ſecond, and the ears in which there was no grain, or where the grain was faulty, compoſed the third.

"The wheat being thus divided, I counted the number of ears in each parcel. I found 400 in the firſt, which conſiſted of the beſt ears; 1600 in the ſecond, which contained the middling and ſmalleſt ears; and in the third, 750 ears, or plants whoſe grain was faulty. I made no account of a great number of imperfect ſhoots, which were not ſix inches long.

"The fields did not look ſo poor to the eye, as this ſeparation proved them to be. This firſt operation was therefore neceſſary to come at the truth.

"When the grain was cleared from the ears, I found, that the 400 ears contained five ounces and a half of wheat, and that the 1600 contained ſeven ounces.

"My curioſity did not lead me to inquire into the contents of the third parcel; knowing that there was no good grain in it.

"In the purſuit of this inquiry, I found that taking one ear with another, of the 400, there were but eleven grains of wheat in each; and that in the 1600, taking one ear with another, there were but three grains and a half to an ear. Eight hundred of theſe grains weighed but an ounce.

"If we add theſe parcels together, we ſhall find that 2000 ears yielded but twelve ounces and a half of wheat, and that it would require 2890 ears of the ſame goodneſs to yield eighteen ounces.

"I confeſs that I was aſtoniſhed at the reſult of my inquiry; which I could not have believed, if I had not ſeen it. But at the ſame time, how greatly was my expectation raiſed, of the advantages of the new culture!

"I have this year formed a greater extent of ground into beds. Too frequent rains have prevented my laying down more than thirty acres in this manner: but I have ſowed all the reſt of my farm with the drill-plough in equally diſtant rows. I have increaſed the quantity of ſeed; regard being had to each circumſtance neceſſary to be attended to; ſo that in ſome fields I have ſown double the quantity of ſeed that was employed in the year 1751: in others ſomewhat more, and in others again leſs.

"All my fields look extremely well, and make a much better appearance than they did laſt year. They are abundantly ſtocked with very ſtrong plants, of a deep green colour: the blades are long and large, and cover the earth better than the common wheat.

"Hitherto, theſe plants have not ſuſtained any loſs, except in one ſpot of about half an acre, where they were gnawed aſunder, juſt under the ſurface of the earth, by inſects. I immediately ſowed it again, and by this means have quite repaired the damage. The inſects have not appeared ſince.

"One of the moſt happy effects of my experiments, is, that they have created a deſire in many perſons in theſe parts, to begin the practice of the New Huſbandry, with trials of conſiderable extent. One perſon, convinced of its excellency, has laid out and ſowed at leaſt twenty-eight acres in beds: another has ſowed with the drill-plough, an hundred and fifty acres ploughed in broad lands. All the land that has been ſowed in beds amounts to about fifty acres: and upwards of two hundred acres, in broad lands, have been ſown with the drill-plough. Every one who has ſeen theſe fields, even the very ploughmen not excepted, agree that they look extremely well, and that they never ſaw, in this country, plants of ſuch ſtrength and vigour as the wheat that was firſt ſown.

"I am extremely happy that my drill-plough has been of ſo general uſe. It has performed regularly every where: people having ſowed with it exactly the intended quantities of grain."

EXPERIMENTS *made by* M. Lullin de Chateauvieux, *in the Year* 1753.

"I am the better pleaſed with being able to give a ſatisfactory account of the ſucceſs of my experiments this year, as the ſeaſons have not been favourable, and extraordinary

ordinary accidents have greatly diminifhed the produce of the crops.

"I fhall divide this account into feveral articles.

"The firft will contain the experiments made on lands laid out in beds, which have borne their fecond and third crop. To this will be added fome obfervations relative thereto.

"The fubject of the fecond will be a detail of experiments made on lands formed into beds, which have yielded only their firft crop. This too will be followed by fome remarks.

"The third will confift of the experiments of two perfons on lands made into beds, of which the firft crop was reaped this year: to which will be fubjoined fome neceffary reflections.

"The fourth article will contain an account of feveral experiments made by divers lovers of agriculture, on lands fown in equally diftant rows, but with the drill-plough.

"As we think it will be extremely ufeful to fhew, by the experiments which have been made this year, that lands produce more corn in the New Hufbandry than in the old, we fhall give an account, in the fifth article, of the crops of fields fown in the common way for fixteen years together; and of thofe of the fame fields cultivated according to the New Hufbandry, fuppofing them not to yield better crops in future years, than they have done in this; a fuppofition the leaft favourable that can be to the new culture, fince we calculate only upon the produce of the firft year's crop, and that too diminifhed by the extraordinary accidents which we fhall mention.

"To fhew the truth of this article more fully, it will be proved in the fixth, that the beft field in the country, though it had been well dunged, yielded lefs wheat than thofe on which the experiments were made, and on which no dung was ufed.

"The feventh article will confift of reflections and obfervations on our practice of the New Hufbandry; and the eighth will fhew the difpofition of our lands for the crop in 1754.

"To avoid repetitions, we fhall obferve here, once for all, that no dung or other manure was ufed in any of our fields, and that our pound confifts of fixteen ounces.

Experiments made on Lands laid out in Beds, which have borne a fecond and third Crop, with fome Obfervations particularly relating thereto.

EXPERIMENT, Numb. I.

N. B. This experiment is marked with the fame number in the year 1752.

"I fhould have known the full produce of this third fucceffive crop on the beds of this field, continues M. de Chateauvieux, if the hail which fell on the third of June had not damaged it greatly. The abundance of rain which fell at the fame time, and immediately after the hail, did ftill greater hurt; for the earth of part of the beds was wafhed away by the torrent of water, fome of the plants were forced out of their places, others were entirely covered with earth, and many were torn up by the roots; fo that it was not poffible to judge what this year's produce would have been by the few plants that were left.

"I am very forry that this accident deprived me of a certain proof, that this year's crop would have been more plentiful than that of 1752: for it would have been evident, that the earth becomes more and more fruitful by the New Hufbandry: a truth which it is of confequence to eftablifh. I can therefore only affirm by conjecture, that this crop would have been greater. My conjectures are indeed fo ftrong, that they amount almoft to a demonftration.

"I draw them from hence, that the corn had a very fine appearance before winter; that the plants grew with great ftrength in the fpring; that they branched more than formerly; that the ears were certainly larger; that they bloffomed extremely well (they were in full bloom by the thirtieth of May;) and, laftly, that they have yielded more ftraw than in 1752.

"It neceffarily follows from hence, that had it not been for the hail and torrents of water, the crop would have been greater than in 1752.

"Though the following experiment fuffered the fame accidents (except that the beds were not broken up by the water) it will fupply the want of that information which we were deprived of in the other, and ftrengthen our conjectures.

EXPERIMENT, Numb. II.

N. B. This experiment is marked with the fame number in the year 1752.

"As I hope this experiment will be found very inftructive, I fhall relate it with the fame care as it was executed. I therefore beg it may be particularly attended to; for it will confirm the advantages of the New Hufbandry. But before I enter into a detail, of which I fhall endeavour not to omit any effential circumftance, it is neceffary to repeat here, that in the journal of 1751, I faid, firft, that the ploughings which had been given in order to prepare the ground for being fown in 1752, had not loofened it fufficiently, and that I tried to remedy this defect by fubfequent culture. Secondly, That this field was fowed on the twenty-fifth of September with 11 pounds and 4 ounces of wheat. Thirdly, That the crop yielded a thoufand and forty-two pounds twelve ounces; and, laftly, That the appearance of the young plants promifed a much greater crop in 1753.

"The culture beftowed upon thefe lands in 1752, rendered them more and more loofe and well divided; fo that with only one ploughing after harveft, which was performed with eafe, I formed new beds, the ridge of which was now in the place where the furrow in the middle of the alley was before. But the earth was ftirred deeper and made much loofer than in 1752. I had already attained almoft a perfect tilth, and eafily forefaw that I might quite complete it in 1753.

"Whilft I laboured affiduoufly in the culture of wheat, from which I would not fuffer any thing to divert my attention too much, till I fhould arrive at a good and certain practice of the New Hufbandry; I neverthelefs determined to begin experiments on lucerne and faintfoin, to cultivate them nearly in the fame manner as wheat. What prompted me to this was, the fuccefs of a fmall experiment the year before. Accordingly, taking this object likewife into ferious confideration, I refolved to leave a part of this field for lucerne, and to fow the reft with wheat. It contained in all one acre, one rood, and eighteen poles, formed into forty-five beds. I left for the lucerne nine beds, the extent of which was about a quarter of an acre, and deftined the furplus to be fowed with wheat as before. I am now very attentive to the experiments on lucerne and faintfoin, and fhall begin next year to give an account of them, and of my manner of proceeding. My practice in this will be found different, in many refpects, from the method which is commonly purfued. I will venture to affirm, that there will be room to be fatisfied with the fuccefs of this branch of hufbandry, than which none can be more interefting, plenty of fodder being as neceffary as plenty of corn.

"I muft therefore beg leave to give the produce of this field, as if the whole of it had been fowed with wheat. This I do, in order to compare the produce of 1753 with that of 1752, as it cannot be doubted but that the nine beds now under lucerne, would each of them have yielded as much wheat, as any of the beds did that were fown with it: nay, perhaps fome pounds more, the lucerne being fown in what I thought the richeft part of the ground. This field was fowed on the firft of September. I increafed the quantity of feed, fowing this time thirty-four pounds fourteen ounces of wheat; whereas in 1751, I fowed but eleven pounds four ounces. Though I fowed this year more than thrice the weight of feed that I did in 1751, it muft not be inferred, that I tripled the number of grains capable of producing plants, becaufe this year's fowing was made with wheat of the produce of the new culture, the grains of which are much larger than thofe of the common wheat which I ufed in 1751, and of which a greater number is confequently required to make up an equal weight.

"This wheat having been ſown pretty early, its plants had time to grow very ſtrong before winter, the cold of which they bore very well: and the ploughing I gave them on the fifteenth of October, by cutting a very deep furrow within about three inches of the rows, ſecured them from the damage which corn frequently ſuffers from rain and the melting of ſnow.

"In the ſpring they made ſtrong ſhoots, grew apace, and branched very abundantly. I aſſiſted them, as I am going to relate, at proper ſeaſons, both with reſpect to the condition of the plants and earth, and to the temperature of the weather.

"On the fifteenth of March, 1753, I gave them the firſt ploughing after winter.

"On the twenty-ſixth the beds were weeded.

"On the eleventh of April, I ſtirred the alleys with the cultivator.

"On the twenty-ſixth, the thiſtles were plucked up.

"On the fourteenth of May, the ſtirring was repeated with the plough.

"On the fifteenth, the ears began to appear.

"On the twenty-ninth, the fourth ſtirring was given with the cultivator with mould-boards.

"On the thirtieth, the wheat was in full bloom.

"On the third of June, the wheat ſuſtained a violent ſtorm of hail and rain.

"On the thirteenth, the fifth ſtirring was given with the new plough with two ſhares, or double cultivator.

"I beg leave to obſerve, that there needs no better proof that wheat, cultivated according to the New Huſbandry, will be little apt to be lodged, than the eaſe with which I performed the fifth culture, after the accidents which happened on the third of June, when the corn had attained its greateſt height. So far was it from being laid thereby, that the whole extent of the plough found free admittance into the alleys, and this laſt culture could be given without damaging the ſtalks.

"Though the whole of our ploughing and hoeing may be performed extremely well with my plough, and the inſtrument which I call the *cultivator*, yet I have thought of making this taſk ſtill more eaſy. Two new inſtruments (not indeed abſolutely neceſſary) will anſwer this end. I propoſe them only as very uſeful, and proper to be employed only the ſecond or third year, when the earth has acquired part of that minute diviſion, of which it is ſuſceptible.

"The cultivator with mould-boards, and the plough with two ſhares, are inſtruments which I have invented this year. I have found them extremely uſeful to give the two laſt ſtirrings, better, and in leſs time than our other inſtruments. The reader may not be diſpleaſed to know what firſt ſet me upon contriving them.

"One cannot enter properly into the ſpirit of the New Huſbandry, without being thoroughly convinced, that the earth cannot be too minutely divided: I will even ſay, till it is reduced to a perfect powder; and that, when one has been ſo happy as to attain this point, it muſt be kept in that ſtate. This will always be done beſt, by uſing the moſt proper inſtruments.

"I obſerved one day, whilſt I was horſe-hoeing my wheat, my plough being then at work, and the earth in a very looſe ſtate, that every time the alleys were ſtirred, they were thrown into a different form; for it is neceſſary ſometimes to make a deep furrow in the middle of the alleys, and at other times to raiſe a ridge in them; and yet, in whatever form the alleys were to be, I had only my plough to perform theſe different operations. It did not ſeem to me reaſonable to ſuppoſe, that two ſo different works could be done equally well with one and the ſame inſtrument; from whence I concluded, that it was neceſſary to have an inſtrument for each of theſe purpoſes.

"I ſoon found what I wanted. The cultivator with mould-boards opens a large furrow in the middle of the alley, by turning over the earth at the ſame time to both ſides. The plough with two ſhares, on the contrary, at the ſame time takes up the earth on both ſides, and turns it into the furrow, which it fills, and thereby lays the foundation of a new bed.

"Theſe inſtruments have this farther advantage, that, without requiring a greater number of cattle, they perform as much work at once going over the ground, as the plough can do in two, and ſometimes three operations. I return to my experiment.

"On the twenty-third of June, the wheat ſuſtained a violent hurricane, which laſted an hour. Several great pear trees were blown down in my orchards, and many large branches were broke off from other trees.

"On the eighth of July, a ſcorching wind blew, which ſhed a great deal of the ripe corn.

"On the ninth the wheat was reaped.

"A month after harveſt, it was threſhed.

"This field yielded 1575 pounds of wheat, deducting from which the thirty-four pounds fourteen ounces uſed for ſeed, the neat produce remaining is 1540 pounds two ounces. Conſequently, in 1753, this field produced 533 pounds four ounces more than in 1752, including what was ſaved in the ſeed.

"The grain of this wheat was very large, and ſo clean, that it did not want ſifting. It yielded plenty of very fine flour, which made exceeding white and well taſted bread.

Experiment, Numb. III.

N. B. This field is marked with the ſame number in the year 1752.

"This field contains one acre and ſixteen poles, and was but in poor tilth. It was ſowed on the twenty-fourth of September, 1751, with ſeven pounds fourteen ounces of wheat, and yielded 441 pounds.

"It was brought into better tilth in 1752, but the beds were not raiſed high enough: I would have given them another ploughing, if the rainy ſeaſon had not prevented it. They were ſown on the eighth of September, with twenty-four pounds twelve ounces of very large grained wheat. The plants were extremely fine before winter, and the rows were well filled. In the ſpring, I found that there were fewer plants than in autumn: inſects had deſtroyed ſeveral of them. I likewiſe imputed the loſs of many to the flatneſs of the beds. The plants acquired freſh vigour after the winter, made ſtrong ſhoots, and branched extremely well. I treated this field in the ſame manner as the former. The plants made nearly the ſame progreſs. They were reaped on the fourteenth of July, and yielded 724 pounds eight ounces. Thus we ſee, that this field yielded 283 pounds eight ounces more in 1753 than in 1752.

Obſervations on theſe Experiments.

"I obſerved in my former experiments, that, as the mould was not ſufficiently looſened, the fields, which were laid out in beds, could not produce ſo plentiful a crop the firſt year, as they would the ſecond or third year, when the earth ſhould be more thoroughly divided. It is evident, that whoever ſhould have given up the New Huſbandry, upon the bad ſucceſs of the firſt year, would have deceived himſelf. Theſe experiments plainly ſhew, that the charge of the firſt year is fully recompenced by the profit of the ſecond, and that this profit will increaſe from year to year.

"Whoever now tries the New Huſbandry, may reaſonably expect better crops than mine, even the firſt year; becauſe, 1. They now know how the earth ſhould be prepared: 2. They may be provided with inſtruments, already experienced to anſwer the deſired purpoſe with conveniency and eaſe. The different circumſtances to be attended to, are likewiſe known. From the knowledge I have acquired in theſe matters, I can ſay, that the preſent appearance of the corn, which I have ſowed this year in beds, promiſes a very great crop. I ſhall likewiſe have occaſion, in the courſe of theſe obſervations, to ſhew, that though the firſt crop may ſeem very ſmall, yet it is in fact more profitable than that of lands cultivated in the common way.

"Let us now proceed to the preſent ſtate of the lands cultivated for two years according to the New Huſbandry, and obſerve what the effects have already been.

When the corn was ſowed, the beds were in a much looſer ſtate than before, and the ſeed was conſequently covered with a fine mould. It came up better: the roots extended themſelves more eaſily, and increaſed in number,

ber, in a foil which fcarcely refifted them: the plants were ftronger, and better able to bear the feverity of the winter; and, by a fmall increafe of the feed, the earth was better filled with plants, and thereby better able to fuftain the accidents which had thinned them before. After the winter frofts were over, the mould was in fo loofe a ftate, that it looked as if it had been newly ploughed; a very different ftate from that of land in the common hufbandry, which, at this feafon, is hard, compact, and very little fitted to afford an eafy paffage to the tender roots of plants. How eafy too did this render all the fubfequent culture! The weeds, already greatly diminifhed, did little damage to the corn; and we may readily conceive that the earth, in this loofe ftate, was eafily penetrated by the rains, dews, and moifture of the atmofphere.

" The effects were, that the plants grew ftronger and taller than before; that they branched into a greater number of ftalks; that the ears were very large, and well filled with grain, if we may judge by thofe which efcaped the hail: that the wheat was very clean; and laftly, that the crop was greater than that of the preceding year, though it had been confiderably diminifhed by the hail, the hurricane, and the fcorching wind which made many of the ears fhed their corn. I tried every poffible means of afcertaining the lofs occafioned by thefe accidents; but in vain. I have therefore given up an uncertain calculation; and can only fay, that I am fure the lofs was very great.

Experiments *made on Lands which had borne a firft Crop, with Remarks on thefe Experiments.*

" We did not expect that the fields we are now going to fpeak of, would yield a crop near equal to that of the fields treated of in the foregoing article. We knew, that the mould is never fufficiently broken and divided the firft year that a field is laid out in beds. Befides, during almoft all the laft year, the earth was too moift to be cultivated properly. The wet mould could not be divided into fmall particles, nor could it be ploughed fo frequently as to admit of fowing it fo early as it fhould have been.

" But every year will not be fo unfavourable to this hufbandry: and when there are alternate changes, fuch as we have had this year, of wet weather and of fair, which will afford time for the different ploughings, we may, with fome certainty, promife ourfelves a greater crop; fince, as we have feen, this depends chiefly upon the good or bad ftate of the earth.

" The whole management of thefe fields having been nearly the fame as that of the fecond experiment, it would be needlefs to give a particular detail of it in our account of the other experiments.

Experiments, Numb. IV.

" This field is a very ftrong good foil. In the Old Hufbandry, great ftrength was required to plough it, and it was neceffary to catch the feafons when they were neither too wet nor too dry. It contains thirteen acres, two roods, and twenty poles. I laid near one half of it out in beds, which, with the alleys, were each about fix feet wide. Part of thefe beds were fown on the thirtieth of Auguft. Conftant rains hindered the fowing of the reft till the twenty-fixth of September. An hundred and eighty-one pounds of wheat were employed in fowing the whole. What was firft fowed, came up well, and the plants were very ftrong before winter: but in one place, almoft all of them were deftroyed by infects. I fowed this fpot a fecond time. The frefh feed was fcarcely able to rife before winter, and yielded much lefs than the beds which had not met with the like accident. The wheat of the beds which were fown on the twenty-fixth of September, was a long time before it fprung up; owing to the drynefs of the earth, which continued almoft the whole month of October. The froft in November ftopt the farther progrefs of the plants. Their produce was much fhort of what was fowed firft; which fhews plainly how effentially neceffary it is to fow early.

" This wheat muft of courfe grow very unequally. Some beds were extremely beautiful, others middling, and the reft very poor: yet, throughout the whole, the ears were very large, and well filled with grain; and the crop would ftill have been a good one, had it not fuffered by the hail which fell on the third of June, and by the other accidents mentioned in the fecond experiment.

" The wheat, being perfectly ripe, was reaped on the 13th and 17th of July. It was threfhed two months after, and the whole produce of this half of the field was 3370 pounds of very fine and perfectly clean large-grained wheat, which yielded a great deal of flour.

" The other half of this field was fowed in equally diftant rows, with the drill-plough, by which means a great deal was faved in the feed: for only 479 pounds of wheat were employed to fow this ground, which, in the common way, would have required about 2016 pounds.

" It was fowed on the 23d, 24th, 26th, 27th and 29th of Auguft. We could work only a few hours each day, on account of the frequent fhowers of rain.

" This wheat rofe perfectly well, grew very ftrong before winter; and was of a deep green colour, which it retained till it began to ripen. The number of ftalks increafed in the fpring. They grew very long, and bore large ears. In fhort, they promifed a fine harveft. But the hail on the 3d of June foon changed the face of the field. It cut off a great number of the ears, broke down many ftalks, and damaged all thofe ears whofe ftalks were ftrong enough to remain upright. This misfortune was common to all my wheat.

" This wheat, being ripe, was reaped on the 9th, 10th, and 11th of July, in very hot, dry weather. It was threfhed a month after harveft, and yielded 5386 pounds of excellent grain.

" Here is an experiment made upon a large extent of ground, cultivated two different ways, and divided into two almoft equal portions, both of which fuffered the fame accidents as equally as could be, according to the beft of my judgment. This experiment offers us a very interefting inftruction.

" The defign of our experiments is, to know which of the different methods of hufbandry is moft ufeful; which will beft promote the public welfare, be moft beneficial to the owners of land, and bid faireft to fecure their productions.

" Let us now compare the produce of each half of this field. It will convince us of a truth of great confequence to be known, viz. that land will produce much more corn when cultivated in beds according to the New Hufbandry, than when it is only fowed in equally diftant rows with the drill-plough; though this laft method is, indifputably, better than the Old Hufbandry.

" We have feen that the part of this field which was fowed in equally diftant rows with the drill-plough, produced 5386 pounds of wheat. If it is continued to be cultivated in the fame manner, it will be in fallow in 1754, and yield no produce: and thus it will bring a crop only every other year.

" The other part of this field, which we formed into beds, produced 3370 pounds of wheat, and is already fown again for a crop to be reaped in 1754. Suppofing this crop to be only equal to that of 1753, the produce of the two years will be 6740 pounds of wheat. Hence it is evident, that, in two years, the produce of the beds will be 1354 pounds more than that of the rows. This difference is very confiderable: and if we would fee it in a yet ftronger light, let us extend the fame calculation to a longer time: for example, to ten years, during which the part fowed in rows will yield only five crops, which, at 5386 pounds a crop, will amount in all to

	26930 lb.
" The part fowed in beds will yield ten crops, which, at 3370 pounds a crop, make — — — — — — —	33700 lb.
" The difference in favour of the beds will therefore be, in ten years, — —	6770 lb.

" We here fuppofe the feafons to be, in every refpect, like the year 1753. But as our obfervations have conftantly fhewn that the crops are always greater after the firft year, which is likewife juftified by the firft, fecond, and third experiments, we may even now venture to pronounce, that the part of our field, which is fowed in beds, in in order to be reaped in the year 1754, and which now makes a promifing appearance, will yield double the quantity it did in 1753. The profit will therefore be much more confiderable than we have made it in the above calculation.

Experiment, Numb. V.

" This field is of a very ftiff foil. It contains five acres and eight poles, and lies floping towards the weft. The beds were well formed, but the earth could not be fufficiently broken, nor could it be fown early enough, on account of the frequent rains. It was fowed on the 8th and 25th of September, with 139 pounds of wheat. The corn came up well, and made a fine appearance before winter. It throve well during the fpring, and when ripe, I cut it down, viz. on the 14th and 28th of July, and the crop yielded 2205 pounds of very fine wheat.

Experiment, Numb. VI.

" This field was reaped in 1752, and immediately formed into beds, with a defign to fow it that fame year. I could not expect that land in fo bad tilth would produce much. My only aim then was, to form it into beds a year fooner. It contained one acre, two roods, and fifteen poles, and was fowed with forty-five pounds of wheat, which yielded 724 pounds.

Experiment, Numb. VII.

" My defire to practife the New Hufbandry upon all my lands as foon as poffible, made me plough another field, which had likewife been reaped in 1752. I could however lay only a part of it out in beds: the reft was fowed in equally diftant rows with the drill-plough. This field could have but one ploughing: nor could that be completed, though feveral ploughs were employed till the 15th, 17th, and 18th of November. The earth was fo moift, that it divided only into large clods. However, I fowed it foon after ploughing, not expecting a great crop. The extent of this field is about fix acres, three roods, and fix poles. It was fowed with 412 pounds of wheat, of which only a fmall part rofe before winter. The number of plants increafed greatly in the fpring: they could not branch fo much as thofe of the foregoing experiments, and the grain beginning to look a little fhrivelled, I reaped it on the 21ft, 23d, and 24th of July. Though this wheat had fuffered the fame accidents as the other, yet it yielded 2646 pounds.

Experiments *made on Lands laid out in Beds, and of which the firft Crop was reaped in* 1753; *with Reflections on thefe Experiments.*

" In our journal of 1752, we mentioned a perfon's having fowed at leaft twenty-eight acres in beds. Though thefe experiments did not anfwer well, we have thought proper to mention them, in order to fhew the caufes to which their want of fuccefs ought to be imputed. They will ferve to inftruct us in fome practices which are more neceffary than might otherwife be imagined, and will fix our attention to circumftances which ought not to be neglected by any one who defires to make the moft of his ground.

Experiment, Numb. VIII.

" Thefe twenty-eight acres were laid out in beds about fix feet wide. The foil is ftrong, and apt to grow very hard. Three rows were fown in each bed.

" Only 460 pounds of wheat were ufed to fow this field, which yielded but 3150 pounds of very clean grain.

" This is a very fmall crop. Let us fee to what it was owing.

" 1. This land was very badly ploughed: it could only be divided into great clods, incapable of fupplying the wants of the plants, and of letting them imbibe the nourifhment neceffary for their growth. That the bad ftate of the land was the chief caufe of the fmuttinefs of this crop, appears from this circumftance; that, in fome fmall parts of the fame field, where the mould was better divided, the wheat was finer, branched tolerably well, and produced a greater number of flourifhing plants.

" 2. This field was fowed too late, viz. not till the laft week in November. Only part of the feeds fprung up before winter; and thefe plants, not rifing in a good feafon, could not make the progrefs that might have been expected.

" 3. Too little feed was fown. It was the more neceffary to fow a larger quantity, as numbers of grains cannot fhoot at all in the ground badly prepared, and many of thofe which do fhoot, are fo buried under the great clods, that they are not able to rife. This field was therefore not fufficiently ftocked with plants.

" Laftly, the hail mentioned before, greatly diminifhed the crop: which, independent of that accident, would not have been plentiful.

" The owner of this field, after remarking thefe bad confequences arifing from the defect of culture, has endeavoured to remedy them, by giving, after harveft, feveral ploughings, which have broken and divided the earth more thoroughly, and prepared the beds for being fowed in good time: the quantity of feed has likewife been increafed; the plants have had time to get ftrength before winter, and their prefent ftate promifes that the next crop will be better. Far from being difcouraged by the bad fuccefs of a firft trial, the perfon we are fpeaking of, convinced of the excellence of the New Hufbandry, is but the more refolved to purfue it. He juftly afcribes the fcantinefs of this crop, not to any defect in the principles of the New Hufbandry, but folely to its having been badly executed the firft year. He foon perceived that thefe faults might eafily be remedied, the fecond year; and therefore has not only continued to cultivate and fow the fame field, but has likewife fowed at leaft twenty-five acres more, laid out in beds, which have been much better ploughed than thofe of the laft year: every circumftance of the new culture has been duly attended to, and the corn, even now, promifes a more plentiful return.

Experiment, Numb. IX.

" Small experiments have led to much greater. As thofe fmall ones are neceffary at firft, not only to create a confidence in the New Hufbandry, but likewife to accuftom people to the practices which it requires, I fhall relate one of this kind, made by a perfon who has adopted the New Hufbandry from principle, and who is every way qualified to inftruct us, and to execute well what he has once conceived to be right.

" A piece of ground, 270 feet long, and twenty-feven feet wide, was made into fix beds, to be fowed with only two rows. This fpot could not be prepared till the firft week in September, nor fowed till the twenty-fourth of October. The earth was very dry, and the wheat rofe unequally, and made little progrefs before winter. By a negligence in the firft hoeing, almoft whole rows of the plants were torn up. In proportion to what was reaped, this little fpot would have yielded 180 pounds of very fine wheat.

" A meafure of oats, which was fowed in beds in a proper feafon, yielded 112 meafures.

" Encouraged by this fuccefs, the fame perfon intends to practife the New Hufbandry in a larger way. He has already formed about ten acres into beds, which are now fown: and he will continue in 1755, and the following years, to lay out twelve acres a year in beds, till he has difpofed all his lands in that manner.

" Another thing intended by this experiment, was, to know whether two rows would not produce a larger crop, in proportion, than three. The fuccefs of this promifes very fair; but it will be right to continue trying it, and likewife to fee what multiplying the rows will do. We fhall fpeak of this hereafter, in order to determine, by real products, what number of rows will beft fuit this hufbandry.

Experiments *made on Fields fowed in equally diftant Rows with the Drill-Plough, by feveral Lovers of Agriculture; as related by* M. de Chateauvieux.

Experiment, Numb. X.

" This, and the following experiment, were made by the fame perfon who made the feventh, mentioned in our journal

journal of 1752, the refult of which encouraged him to proceed to larger trials, and to prove the advantages of this hufbandry, by new examples. To be more exact in thefe experiments, he refolved to try the Old and the New Hufbandry in the fame field.

"For this purpofe he chofe a field, the foil of which is reckoned equally good in every part. Its whole extent is five acres, two roods, and fifteen poles, fquare meafure. Of this two acres, three roods, and 15 poles were deftined to be fown in the old way; and two acres, and three roods, to be fown in equally diftant rows with the drill-plough. The whole field was equally ploughed and dunged, and fowed on the fame day, viz. the 19th of September, with the fame wheat. In fhort, there was no other difference than in the quantity of feed, and the manner of fowing it.

"The part of this field which was fowed in the old way took up 698 pounds ten ounces of wheat, which produced 2969 pounds of very fine grain. This is about four and a quarter for one.

"The other part of the field was fowed with the drill-plough, with 243 pounds, which yielded 3187 pounds two ounces of very fine large-grained wheat. The proportion here is as thirteen to one.

"We find in favour of the drill-hufbandry; firft, that, though the furface of this ground was fifteen poles lefs than that of the other, yet it produced 208 pounds two ounces of wheat more: and, fecondly, that, deducting the feed of each crop, this neat produce is ftill more confiderable, as appears by the following account.

Produce of the part fowed in the common way	2969 lb.	
To be deducted for the feed	698 lb.	
Remains	2271 lb	
	lb.	oz.
Produce of the part fowed with the drill plough	3187	2
To be deducted for the feed	243	-
Remains	2944	2

"Which is 663 pounds two ounces more than the produce of the Old Hufbandry.

"The whole field was fomewhat damaged by the hail on the third of June, which leffened both the crops a little.

Experiment, Numb. XI.

"Another field, the foil of which is better than that of the former, having been well ploughed, was fowed in equally diftant rows, with the drill-plough, on the tenth of October. It contains one acre, three roods, feven poles, and two yards of ground, was not dunged, and was fowed with 121 pounds eight ounces of wheat, which yielded 2979 pounds of very fine clean corn; which is twenty-four for one.

"This return is very confiderable, and greatly furpaffes that of the foregoing experiment. It fhould be remembered, that the furface of this field is lefs. It did not, indeed, receive any damage from the hail.

Experiment, Numb. XII.

"We mentioned in the journal of 1752, a perfon's having fown about 150 acres in equally diftant rows, with the drill-plough; and we obferved, that a great part of the ground could not be well ploughed, and that the whole of it could not be fowed till November and December. Thefe two circumftances gave no room to hope for much fuccefs. About forty acres, which were the laft fown, were dunged: but thefe yielded the leaft crop of any.

"This great extent of ground was fowed with 9932 pounds of wheat. To have fown it all in the common way, would have required 29524 pounds of wheat. Confequently here is a faving of 19592 pounds of wheat, in the feed.

"The foil of thefe fields being of different qualities, their produce was proportioned thereto, varying from exceeding good to very bad. The 150 acres yielded in all 86058 pounds of wheat. The crop would have been more confiderable, if about thirty acres had not been greatly damaged by hail. The lofs which it occafioned, fhews plainly the great probability of having larger returns in other years, when we become more perfect in the practice of the New Hufbandry, to the want of which the bad fuccefs of this firft trial has certainly been owing in a great meafure. All the lands of this farm are now fowed again with the drill-plough. They confift of about 200 acres, and afford a pleafing profpect for the enfuing harveft.

Experiment, Numb. XIII.

"A field of four acres, was fowed in the middle of October with 243 pounds of wheat. It ufed generally to require about 850 pounds. It yielded 2268 pounds. This, adds the perfon who has fent me this account, is as much as I have had from any other field fown in the old way.

Experiment, Numb. XIV.

"The fame perfon who made the foregoing experiment, fowed another field of about four acres and a half, of a poorer and colder foil, towards the middle of November, with 333 pounds of wheat. In the old way, it ufed to be fowed with 972 pounds. It yielded 1260 pounds. The corn in this field remained thin. It did not branch fo well as that of the former. The perfon who fends me this account of thefe two experiments adds: "It muft be obferved, that the drought, as well of the autumn as of the fpring, was unfavourable, efpecially to the late fown wheat. Thefe experiments have encouraged me to purchafe a drill-plough, and to fow all my lands with it in equally diftant rows, according to the new method, this year 1753: only I have obferved to fow earlier, viz. between the middle of Auguft and the middle of September; and thicker, that is to fay, forty-five pounds, on the fame extent of ground where I fowed but thirty-four pounds and an half, and forty-one pounds and an half in 1752. My plants, hitherto, make a fine appearance, and are very thick: their blades are large, and the whole is in great vigour."

Experiment, Numb. XV. by M. de Chateauvieux.

"I have extended my experiments to an eftate where I have not time to make any long ftay myfelf, fo that what is done there is left to the difcretion of fervants, whofe eye, as is well known, is not like that of the mafter.

"The lands of this place are very poor: they produce but little corn, though that little is exceeding good. In 1752, they were very badly ploughed, and this ploughing was fpoiled by heavy rains, juft as we were going to fow. I ordered the whole to be fowed with the drill-plough, except two acres, which were fown in the old way. Some few fields were a little better ploughed than the reft. Thefe produced pretty good wheat, the others were very poor. However, I have reafon to be pleafed with my having fowed in this manner. I judge of it by the produce of the two acres which were fown in the common way, and which yielded me no more than exactly the quantity of the feed beftowed upon them.

"The true caufe of this was the bad condition of the lands. They are in much better tilth this year. All of them have been fown with the drill-plough, in a favourable feafon, and my fervants affure me that the corn rifes finely.

M. de Chateauvieux's *Account of the Crops produced during Sixteen fucceffive Years, by Fields cultivated and fown in the common Way, and of which Part was conftantly dunged; compared with a Crop of the fame Fields cultivated without Dung, according to the New Hufbandry, even fuppofing them not to yield more than they did in 1753, which was their firft Crop, and which was greatly diminifhed by the unforefeen and extraordinary Accidents already mentioned.*

"The refult of our experiments would be of little ufe, if it extended no farther than our private inftruction. To render it of more general fervice, we fhall here give a com-

compariſon of the produce of lands cultivated according to the Old Huſbandry, and according to the New, that every one may judge which of the two is moſt likely to anſwer beſt.

" This parallel will ſhew how much the New Huſbandry is ſuperior in point of advantage to the Old. We are to ſuppoſe all the circumſtances of the ſeaſons to be like thoſe of the years of which we have compared the products. But as the expence of culture is an object well worth conſidering, and as that expence may not be equal in both ways, I beg leave to lay down here as a fact, " That the charge of the new culture is leſs than that of the old." I have tried it, and find it ſo; as I ſhall, hereafter, prove beyond diſpute.

" By the old culture, in the farm which I now cultivate in the new way, I ſhould have had but two fields ſown in 1752; to be reaped in 1753, viz. that of the experiment Numb. IV. and that of the experiment Numb. V. Theſe two fields contain together eighteen acres, two roods, and twenty-eight poles. I have calculated their produce during ſixteen years, viz. from 1730, to 1745, incluſively. They have yielded, in that time, eight crops, the total produce of which has been 146863 pounds of wheat: deducting from which, 42130 pounds for the ſeed ſown in the eight years, the neat produce will be reduced to 104733 pounds.

" It is proper to obſerve that this wheat was meaſured every year in the barn, as ſoon as it was threſhed, and before it was ſifted: an operation which always occaſions a conſiderable diminution, though we do not make any allowance for it here.

" Let us now ſee what crops the preceding experiments give us room reaſonably to expect from the ſame two fields in ſixteen ſucceſſive years of the New Huſbandry; to judge only by that of this firſt year, 1753, unfavourable as it is.

" The field, Numb. IV. was ſowed, half in beds, and half in equally diſtant rows. I am obliged to ſuppoſe it to have been ſowed entirely in beds; for it cannot be doubted but that the part which was ſowed in rows, would have produced as much as the other: conſequently the whole crop of the two halves, at 3370 pounds each, would have been 6740 pounds.

" As the ſame fields yielded a crop every year, in the New Huſbandry, we ſhall have ſixteen crops inſtead of eight: ſo that, multiplying the firſt year's crop, 6740 pounds, by ſixteen, the total produce will be 107840 pounds; to which muſt be added that of the experiment Numb. V. which was 2205 pounds; which being alſo multiplied by ſixteen, will produce a farther quantity of 35280 pounds for the ſixteen crops. This, added to the amount of the experiment Numb. IV. will make in all 143120 pounds of wheat for the ſixteen years.

" If we afterwards deduct from this, the quantity of ſeed uſed in theſe two fields during the ſixteen years, which amounts to 8016 pounds, the neat produce will be — — — — —	135104 lb.
" In the old way, the ſame fields would produce, in ſixteen years, only — —	104733 lb.
" The difference in favour of the new culture is therefore — — — —	30371 lb.

" Beſides the advantage of reaping a much greater quantity of corn, there are others which highly merit our attention. This corn is not mixed with any ſeeds of weeds, and its quality is greatly improved by the abundance of nouriſhment which the plants are ſupplied with by the frequent ſtirrings of the earth in this huſbandry, more than in the old.

" But how fine a proſpect does the propoſition which we advanced before, afford us beyond all this! viz. " That the crops of the ſecond and following years, would be ſtill more plentiful than the firſt." What ſome might then think only an object of hope and ſpeculation, is already realized, and proved by experience. All this deſerves the moſt ſerious attention. The New Huſbandry will certainly, in time, acquire a ſuperiority over the Old, greater than we can now imagine.

Proofs that the beſt Field in the Country, though the greateſt Part of it was dunged, yielded leſs Wheat than thoſe of the Experiments, Numb. II. *and* XI. *in which no Dung was uſed. By* M. de Chateauvieux.

" The proofs of the advantages of the New Huſbandry cannot be too greatly multiplied; and all thoſe which are the reſult of experience, deſerve to be communicated to the public.

" The field we are going to ſpeak of, is generally, and juſtly, reckoned the beſt in the country. Its ſoil is excellent, very deep, and extremely fertile. This field is dunged very often. Its nearneſs to the farm-yards renders the carriage of manure extremely eaſy, and is the cauſe of its getting perhaps more of it than may be neceſſary. Its ſituation too is excellent, riſing on all ſides above the neighbouring grounds, and the highways which ſurround it; by which means it is leſs expoſed to be hurt by wet, the water finding an eaſy drain from off it.

" The extent of this field is 6087 fathoms (four acres and eight poles.) It was ſowed in 1752, for the harveſt of 1753, and the greateſt part of it was well dunged.

" It is not the cuſtom of the place I am ſpeaking of, to deſcribe the extent of a field by the number of acres contained in it, but by the number of meaſures of wheat with which it is ſowed. Eight meaſures uſed generally to be employed to ſow this: but the quantity of ſeed was leſſened this laſt time, and only ſeven meaſures were ſown. We have hitherto ſuppoſed the ſurface of this field to be equal to that of the other fields of the ſame country, in which eight meaſures of ſeed are ſown.

" But as I was deſirous to be more preciſely exact, in order to form the compariſon I purpoſed making, I had recourſe to the geometrical plans of the lands, and found the contents of this field to be, as I ſaid before, 6087 fathoms: now, the cuſtom of the village to which it belongs is always to ſow at leaſt eleven meaſures in a ſpace like this. One field, among others, very near to this, and which is but twenty-four fathoms and thirty-two feet larger, has always been ſown with twelve meaſures.

" A new cauſe of the fruitfulneſs of this field, unknown before my obſervations, is, that the farmer wiſely took care to ſow it with a leſs quantity of ſeed. The plants throve better, when the land was not over ſtocked with them. This field will therefore help to prove the truth of one of the firſt principles of the New Huſbandry, viz. that the quantity of ſeed generally uſed ought to be diminiſhed: a propoſition which deſerves our entire confidence, becauſe the ſeed here has, from time immemorial, been reduced to eight meaſures, and they have been ſufficient to produce very plentiful crops. The farther reduction made in 1752, to ſeven meaſures, muſt alſo be approved of, ſince the crop which theſe yielded was very fine.

" Theſe preliminary obſervations ſeemed neceſſary, before we proceeded in our detail. This field was ſowed with about 850 pounds of wheat. It was finer during the whole ſummer than any wheat in the common way. It was reaped at a proper time, and yielded about 6646 pounds, from which muſt be deducted, firſt, the 850 pounds of ſeed; and, ſecondly, the value of the dung, which is equal at leaſt to 1260 pounds of wheat, together with 2110 pounds; which deducted from 6646 pounds, the total produce, leave for the neat produce 4536 pounds.

" The crop of 1753 was diminiſhed by the hail on the third of June. The value of this loſs is not known; but we may fairly compare it with the experiment Numb. II. which likewiſe ſuffered by the ſame hail. We confeſs that this compariſon is not abſolutely exact, with reſpect to this accident; but it muſt alſo be granted, that this circumſtance cannot occaſion any very great error. We muſt likewiſe premiſe, that we ſhall not reckon the produce of a ſmall ſpot which is pretty commonly ſowed in March in the year of fallow, becauſe it hardly equals the expence of dung and ploughing.

" The neat produce of the experiment Numb. XI. on a field ſowed in equally diſtant rows, was 2857 pounds eight ounces. But the extent of that field being only one

one acre, three roods, seven poles, and two yards, we must calculate what the crop would have been in proportion, if that extent had been four acres and eight poles (6087 fathoms) supposing it of the same quality. We shall find, that the field on which our experiment was made, would have produced neat 8006 pounds of wheat; deducting from which 4536 pounds, for the neat produce of the field cultivated in the old way. The difference in favour of the New Husbandry, without dung, will be 3470 pounds of wheat.

" We have seen by the experiment Numb. II. that this field laid out in beds, and having borne its second crop, yielded neat 1540 pounds of wheat. Its extent is but one acre, one rood, and eighteen poles; so that we are to see what crop it would have yielded if its extent had been four acres and eight poles, supposing the quality of the soil to be the same. The rule of three shews us again, that its neat produce would have been 5681 pounds of wheat, which we are to double for the amount of the next year's crop, every year yielding a crop in the New Husbandry; whereas the field it is compared with would lie fallow this year. Thus two years will yield 11362 pounds of wheat; from which deducting 4536 pounds for the neat produce of the same field, cultivated in the old way, during the same space of time, the difference will be 6826 pounds of wheat in favour of the New Husbandry.

Reflections and Observations on the Practice of the New Husbandry, by M. de Chateauvieux.

" The chief object of our reflections last year was, the effect which ploughing and culture have upon plants. They seem to us to be confirmed by the following observations.

" 1. The productions were greatest in those places where the earth had been most loosened, and brought to the finest tilth.

" 2. We have seen plainly, that, in order to improve our tillage, it is necessary to make the great furrow in the middle of the alleys very deep, because that furrow being afterwards filled up, and a new bed made over it, there is a greater depth of light well loosened mould immediately under the roots of the plants.

" 3. We can affirm, that we have this year, without much trouble, ploughed our beds from fifteen to eighteen inches deep, which is very considerable; but we must not flatter ourselves, that this depth can always be attained the first year; it is by continuing this same culture that we shall insensibly reach it.

" 4. To have great success, requires proper care and judgment in performing every part of the New Husbandry. The culture which is well executed, will be of very great use; but that, on the contrary, which is badly done, will be of no service to the plants, and may even prove very detrimental to the next year's crop.

" 5. To perform this culture with advantage, it is therefore necessary to observe this important maxim of tillage, so little attended to by many farmers, " never to set the plough to work, when the earth is too moist." I have adhered to it strictly, and have never suffered my lands to be touched till they were dry. We have tilled when the weather has been very dry and very hot, and then it was that our culture had the best effect; the stiffest land having been broken by the preceding ploughings, was provided with the moisture necessary for plants, from its surface to the bottom of the furrows; and the plants were sensibly benefited by all our frequent stirrings.

" 6. I was so struck with this, that I marked several stalks, to see how much they grew each day. From the time that the ears began to appear, till they had done blossoming, I found that they grew an inch in four and twenty hours. The hottest days were those in which the stalks grew most, whilst all vegetation seemed almost suspended in the wheat in the common way.

" 7. This observation led me to another. I was greatly surprised one day to find my stalks just as I had left them the day before. The next day, and the day after, I found them still the same. In short, they grew no longer from that time.

" So sudden a change raised my curiosity greatly, and I resolved to find out the cause of it. The time when they ceased to grow, was immediately after they had done blossoming. I judged that from that time all the sap was conveyed to the ear, to form the grains, and that the rest of the plant had only what was necessary to prevent its drying too soon. This dispensation of the nutritive juices seemed to me very remarkable: all their forces seem then to unite, in order to form, fill, and ripen the grain, which is the most useful part. I was afterwards confirmed in this, by observing, that it was from that very time that the stalks and blades began insensibly to lose their deep green colour, and that this green grew lighter and lighter every day; a sure sign of a diminution of sap in those parts.

" 8. It is likewise of very great importance to know, which is the most proper time for sowing; for the growth of plants depends greatly on this circumstance. Late sowings have not answered; but the early ones have produced plants, whose vigour has enabled them the better to resist the winter's cold, and to branch out the more abundantly. By attending to this circumstance, the farmer will enjoy the desirable advantage of having his corn ripen early, and of its being less exposed to the dangers of the summer season; for we have seen that the wheat which was sowed first in the new method, ripened thoroughly as soon as that which was sowed in the old way. It is proper to know this, in order to be sensible of the necessity of beginning to plough early, that the seed may be sowed in due time.

" 9. I must beg leave again to make a few reflections relative to the quantity of seed most proper to be sown. It is of the utmost importance to know how to proportion the quantity of the seed to the strength and richness of the soil, so that each may have its due proportion. The experiments already made, help to direct us; but I think others still necessary, before we can trust absolutely to our knowledge in this point.

" At present I shall only advise sowing the same quantity of seed as I did in 1752. I fancy that proportion will not differ greatly from what a longer practice will shew to be best. However, the same quantity of seed will not do for every soil. It must be varied with judgement, and regulated according to the circumstances of the season, and the better or worse condition of the land. I think, too, that in the first, and even the second year of the trials which may be made, it will be proper to sow a little thicker than I did in 1752. The farmer will easily perceive, that when his lands are well loosened and brought to a good tilth, they will require less seed; but till then, he will do well not to be over sparing of it.

" 10. We cannot yet determine so exactly as we could wish, what breadth the beds, including the alleys, should be of, to make the ground produce the greatest quantity of corn; nor whether it would be best to sow more or less than three rows. We confess, that we should be glad to see a longer series of accurate experiments, and to have a greater knowledge of this matter, before we pretend to fix it. Our beds have always been about six feet wide.

" M. Duhamel, who first introduced this New Husbandry in France, intends to make experiments by sowing only two rows. If they should yield more grain, the breadth of the beds may certainly be diminished: and as it is of consequence to multiply and vary experiments, in order to determine this point, we now have several beds sown, some in two, and some in three rows. I have likewise tried what multiplying the number of rows in some fields would do; and the result of this experiment promises an advantage in that way of sowing. The success of this first trial was as follows.

" When the field of the experiment Numb. II. was sowed, I observed, among the rest, ten beds which the ploughman had made wider than the others. I was sorry at first, that any part of the ground should be lost; but, upon second thoughts, I determined to sow those beds with two turns of the drill-plough; and consequently to plant them with six rows of wheat. I did so; and when the first ploughing after winter was given, little regard was paid to the two outside rows, which were torn up by the plough in several parts; so that there remained but four or five rows in those places.

" The

"The wheat of these beds, not excepting even the middle rows, grew as high, and branched as much as that of the others, in which there were but three rows. I examined them frequently with great care, and was assisted therein by several persons, very capable of judging and making good observations. The only difference we could distinguish, and that was scarcely perceptible, was in the ears, which we thought rather shorter in the middle rows than in the others; but as there was a greater quantity of them, we judged that these beds would yield the most grain.

"We were not mistaken; for their produce was as follows: the ten beds, sown with six rows each, yielded ninety-one pounds of wheat more than ten beds sown with three rows each. But as this result does not set the matter in a sufficiently clear light, we must have recourse to the following calculation. The six rowed beds took up more ground than those which had but three rows: two beds more might have been made out of the surplus of their breadth; so that there would, in that case, have been twelve beds instead of ten. The question therefore is, whether this ground, made into ten beds, produced more than it would have done if it had been made into twelve beds of three rows each. To which I answer, that it did produce thirty-eight pounds more; and that there was likewise a seventh part more straw.

"As this experiment deserved to be repeated, I have tried it in a larger way. I have laid several acres out in beds of about seven feet wide: they are sown with six rows: the plants are very fine, and I impatiently wait the event.

"Though I have continued not to dung my fields, the plants still grow very tall, and produce fine long ears, well filled with plump grain.

"I am indebted to the New Husbandry for the recovery and improvement of worn-out meadows. They have already yielded me plenty of fodder, the value of which ought to be added to the produce of the fields, because the New Husbandry is the immediate cause that manure can be spared to enrich those meadows.

General Disposition of the Lands for the Crop of 1754.

"The more I have studied the principles of the New Husbandry, the more I have been convinced of the advantages attending it. My experiments have not only confirmed me in this opinion; but they have likewise shewed me, that my practice has been consistent with those principles. This made me determine to lay the whole of one of my farms out in the new way, as soon as I possibly could; its extent being no more than I can direct almost the whole culture of myself.

"I have compleated it this year. All the fields, of which only half used to be sowed every year in our old way, are now laid out in beds. I have sowed them all, with a design to continue doing so for the future every year. They look exceeding well hitherto: the plants are extremely fine, and promise a greater crop next year, than that of the experiments of the foregoing years.

"These experiments have likewise made a strong impression on several persons in this country, each of whom judged of the New Husbandry, as his inclination, or prospect of advantage, directed. It is true, our farmers are more generally inclined to sow their lands in equally distant rows, with the drill-plough, than to lay them out in beds; the proper management of which, say they, is attended with much more care and trouble. My drill-plough is preferred on account of its simplicity. It began to be used last year, and numbers of fields near this city (Geneva) have been sowed with it this year.

"Several of our peasants have likewise tried the drill-plough, and their example will be of consequence hereafter. Their unwillingness to come into any new practice is well known: but this seems to get the better of their prejudices; and the prospect they now have of greater crops than usual, makes them regret their not having sowed a larger extent of ground in this manner.

"We have about an hundred and fifty acres sowed in beds, and also near a thousand sowed in equally distant rows. Such large experiments, and made on different soils, cannot but afford new instruction: the facts will be better ascertained, and people will be more thoroughly convinced that the greater product of the crops is owing to the New Husbandry, and not to favourable circumstances, to which they are too apt to impute it. These experiments, say they, have been made on the very best soils; it is much easier to prepare two or three roods of ground, than an extent of several acres; these little spots have been cultivated with vast care; it is almost impossible to bestow the same attention upon large tracts of land.—Luckily, several lovers of agriculture are making large experiments, which already prove, that the New Husbandry may easily be practised in any extent of ground whatever."

CONCLUSION.

"Any one may now judge, by the experiments which have been made these last four years, and by the success which has attended them, how far the principles of the New Husbandry are justly founded, and how far we are in the right road to give still farther demonstrations of its excellence.

"The lands on which it has been already practised, leave no room to doubt that all its operations may be performed with ease: and at the same time they prove to those who shall be inclined to cultivate any part of their farms in the same way, that they may do it with equal advantage.

"Convenient instruments for executing this culture are already invented and made. The use which has been, and still is, made of them, ought to increase our confidence in them. It is by their means that the two most essential articles towards securing success, are obtained: the first is, the means of forming, ploughing, and cultivating the beds, with great ease and little expence: the second, that of sowing land more regularly, and of giving it the exact quantity of seed that may be thought most proper, by means of the drill-plough, which buries the seed at its proper depth in the furrows, covers it over, and, in short, performs the whole business of sowing, with great dispatch, and a considerable saving of seed.

"The chief obstacles being now removed, we may reasonably hope that the New Husbandry will gain ground every year. Numbers of intelligent persons, truly zealous for the public good, have seen how my lands were cultivated, and have been curious enough to be present at all the operations of this culture. They have frequently told me, that the public have not a right notion either of the New Husbandry in general, or of the ease with which it is performed. They themselves have wondered at it, and pressed me to publish a circumstantial account of the manner in which I have introduced this new method into our country, that they might also instruct their countrymen therein. I have yielded to their solicitations; and shall continue to communicate my farther observations in this fourth year of my practice of the New Husbandry."

EXPERIMENTS *made by* M. Lullin de Chateauvieux, *in the Year* 1754.

"My experiments in the year 1754, will afford a fresh proof of what I said in my accounts of those of the preceding years, viz. that land, by continuing to be cultivated in the new way, will become more and more fertile, and produce greater crops even in the second or third year, than in the first; because the earth will then be in a looser state, which is highly necessary in order to have plentiful productions.

"This proof ought to be received with so much the more confidence, as the seasons of the year 1754 were not favourable to the growth of corn. It was an extremely dry year; the earth had not the degree of moisture which is necessary to promote the vegetation of plants; the wheat was in general very thin and low, and numbers of farmers did not reap above half the crop that the same lands had yielded them in 1752.

"The wheat suffered great accidents early; for it was rusted in October and November. Till then it was very strong, and promised well; but afterwards, it turned yellow on a sudden. The rust made a great progress. I met with places where the ground was entirely covered with the

the powder of this diſtemper. The vegetation of the plants before winter, was from that time nearly at a ſtand.

" They were likewiſe hurt, and perhaps ſtill more, by the froſts which began again in March, and laſted till the 20th of that month. Theſe froſts rooted up prodigious numbers of plants of the wheat ſowed in the common way, which withered in a few days. Some fields ſuffered ſo much by this accident, that it became neceſſary to plough them anew, and to ſow them again with oats, or other ſpring corn.

" To ſhew the reſult of my experiments more diſtinctly; I ſhall range them in the following order.

" The firſt article will contain an account of three experiments made on lands laid out in beds, and which have borne a third and a fourth ſucceſſive crop; to which I ſhall add ſome remarks particularly relative thereto.

" In the ſecond article, I ſhall relate four experiments which I made on lands formed into beds, which had borne a ſecond crop. Theſe too will be accompanied with ſome reflections.

" The third article will give an account of three experiments made on lands formed into beds, which have borne a firſt crop, and of the manner in which I tilled them, in order to prepare them for ſowing. This will give riſe to ſeveral remarks.

" The fourth article will inform the public of ſome other experiments made on lands laid out in beds, which have yielded a firſt and ſecond crop. This will be followed by ſome intereſting obſervations.

" In the fifth article I ſhall relate ſeveral experiments made by divers lovers of agriculture, on lands ſowed in equally diſtant rows with the drill-plough.

" The ſixth article will contain an account of the produce of ſeveral fields ſowed in equally diſtant rows, with the drill-plough.

" In the ſeventh, I ſhall make ſome general obſervations on the experiments contained in the foregoing articles.

" I ſhall ſpeak, in the eighth article, of the experiments which I have made on beds ſowed with ſix rows of wheat, and compare their produce with that of others, ſowed with only three rows. The reſult of this will enable us to judge how many rows it may be beſt to ſow.

" In the ninth article, I ſhall give a circumſtantial detail of an experiment which I made in order to be more ſure of the beſt way of ſowing the beds; and to be able to determine more exactly, what quantity of ſeed is moſt likely to produce the greateſt crop.

" Before I enter upon either of theſe ſubjects, it will be proper to obſerve, that I have not uſed any dung, or any ſort of manure, for my fields or beds; purpoſely to be the more certain of the effects of this new culture, and to ſee what land could do by mere dint of ſtirring it. My dung has been laid, as uſual, upon my graſs lands, where it continues to be of wonderful advantage.

" I ſhall continue to reckon by the pound of ſixteen ounces."

EXPERIMENTS *made on Lands formed into Beds, which have yielded a Third and a Fourth ſucceſſive Crop: with ſome Obſervations particularly relative thereto.*

EXPERIMENT, Numb. I.

N. B. This field is marked with the ſame number in the journals of 1751, 1752, and 1753; and is the ſpot on which I made my firſt experiments in 1751. This is the fourth ſucceſſive crop.

" The ſmall ſpot of ground on which I made the experiment I am going to ſpeak of, being only a ſingle bed, 160 feet long and five feet wide, would not deſerve to be taken notice of in this account, were it not for a circumſtance extremely remarkable, and the more worthy of our attention, as the ſucceſs it was attended with, affords an unexpected and indiſputable proof of the fruitfulneſs which may be expected from land cultivated in the new way. If farmers will but continue it to the third or fourth year, they will then be ſure of having their ground in excellent tilth, well looſened and divided, and its pores properly opened, and exceedingly multiplied. That this will be the caſe, cannot be doubted. Yet ſome may perhaps be weary of cultivating their lands for ſo long a time, before they attain that perfection of culture, which we have all along declared to be neceſſary, in order to have great ſucceſs.

" To prevent the diſguſt which might ariſe from ſo diſtant an expectation, and to encourage the lovers of the New Huſbandry, I ſhall obſerve, in the firſt place, that there are, in every country, conſiderable tracts of good land, which may be brought to a proper tilth in leſs time. I am, however, ſenſible how much the progreſs of the New Huſbandry would be promoted by the finding of ſome ſhorter way to break and looſen the earth, in ſoils of an inferior quality; and accordingly I have tried whether this cannot be done.

" I have ſucceeded therein fully to my ſatisfaction; and can now ſay with certainty, that land may be brought to a ſufficiently looſe ſtate, even the firſt year, by ploughing it in the manner I ſhall explain in the third article, experiments VIII. IX. and X. the crops of which were very good.

" The moſt certain and moſt inconteſtable principle of the New Huſbandry, is, that the earth muſt be thoroughly looſened by deep and frequent ploughings and repeated culture. In conſequence of this, I examined very carefully whether my lands were more looſened and rendered lighter by my manner of performing the operations of the New Huſbandry, than they were when cultivated in the common way. All my obſervations convinced me that they were.

" The firſt glance of the eye ſhewed me, that the ſurface of the ground was ſmoother: on ſounding the ploughings, I found them deeper; leſs ſtrength was required to plough: two horſes, and ſometimes only one, or a ſingle ox, did with eaſe what would otherwiſe have required at leaſt double that number of cattle. A manifeſt proof that my lands were in excellent tilth.

" If, after having thus examined the lands themſelves, I conſidered their productions, I had a freſh proof of their being brought to that ſtate of pulverization, in which alone plants can thrive well. My wheat was infinitely ſtronger than that in the common way; and, upon a minute examination, I found, that each plant had a greater quantity of roots, ſtronger, thicker, and much longer, than other wheat; and that the blades were broader and longer, and of a much deeper green. The plants had generally a great number of very thick and long ſtalks, which were crowned with large ears quite full of grain, and much heavier than thoſe of the wheat raiſed in the common way.

" All theſe obſervations were ſufficient to convince me, that my lands were in the ſtate I wiſhed them to be; that is to ſay, that they were looſened and divided ſo as to be capable of yielding great productions.

" It was therefore leſs to ſatisfy myſelf, than to give the public a farther proof of the excellence of the New Huſbandry, that I made the experiment I am now going to relate. It is an intereſting one in every reſpect; and I doubt not but that it will induce many others to make the like trial. I can aſſure them that they will find it well worth their while.

" When the harveſt of 1753 was over, I immediately ſet about ploughing my fields, and forming the new beds that were to be ſowed. The year was a very dry one. I uſed frequently to walk, both over the beds, and over the fields cultivated in the common way, where the corn had likewiſe been lately cut down.

" The firſt thing that ſtruck me in theſe walks was, the difference which I found in the ſtubble. That of the fields cultivated in the common way was ſo poor and weak, that it ſcarcely oppoſed the motion of my feet. That of the beds, on the contrary, reſiſted greatly; I often felt it break under my feet, and frequently met with tufts of twenty, thirty, forty, and ſometimes more ſtalks, which ſtopt me ſhort, like ſo many little buſhes.

" I am the more particular in my account of this ſtubble, becauſe it ſhews the great ſtrength of the plants; which they would not have had if the earth had been leſs well prepared. Beſides, this ſtubble has its real uſe, as I ſhall ſhew elſewhere. It is a much better manure for land, than the common ſtubble.

" This obfervation led me to examine carefully what other differences I could find between the fields cultivated either way. The moft important is, the ftate of compreffion which thofe in the common way were in after harveft. They offered nothing pleafing or fatisfactory to the eye; the earth was extremely hard, clofe and compact; and its furface almoft as firm as that of a beaten road.

" The fields in the new way, prepared by better ploughings made at proper feafons, were, on the contrary, ftill very light and foft in the middle of the beds, in the intervals between the rows of ftubble. The earth gave way like fand, when trod upon; and though it was very dry, I thruft a ftick of green willow eight or ten inches deep into it, with great eafe, though I could not by any means pufh it at all into the land which had been cultivated in the common way. This plainly fhews the better ftate of the former.

" Laftly, I compared thefe fields with thofe that were in fallow, which had been ploughed, and were intended to be fowed in autumn. I found the tops of the late reaped beds, in much better condition than the common fields which were under fallow. This made me immediately conclude, that thefe very beds might be fowed again with fuccefs, in the fame places where the corn grew the year before, without ploughing them.

" I thought, however, that, if this trial did fucceed, it would be owing, in fome meafure, to the culture of the alleys, and that this would fully prove their utility. This was another reafon for my trying the experiment.

" It appears by this, that my chief defign was to try whether the fame ground could be fowed, in the fame place, two years running, without ploughing; and to fee how ftrong the plants would, in that cafe, be at harveft.

" I was confequently to avoid, in fowing it, every thing that might fupply the want of ploughing, and to ftir only juft fo much earth as was abfolutely neceffary in order to bury the feed. This confideration prevented my ufing the drill-plough, the fhare and harrow of which divide and loofen the earth perfectly well, as deep as the feed is planted.

" All that I did to this bed, was, barely to pull up the ftubble, and afterwards draw a line with a ftick, as if it had been for fowing lettice. The feed was dropped by hand into three of thefe channels, and afterwards covered with a rake.

" Birds had done great damage to the wheat which I fowed the year before in this ground. To avoid this accident now, I fowed a kind of corn called fpelt, which is ufed in many places inftead of wheat. The Germans cultivate it greatly. The fpelt which I fowed is of a fomewhat different kind. The grain of both forts is inclofed in double hufks, very thick, and of which the outer one does not open eafily; fo that birds cannot well pick out the grains.

" I fowed this bed very thick, concluding that the plants would not branch much: and I fowed it early, viz. on the nineteenth of July, becaufe this grain remains a whole year in the ground, from the time of fowing till it is ripe. I ufed in all eleven ounces of feed, which foon fprung up, and the plants made very ftrong fhoots; but I thought them too thick.

" As this ground had not been ploughed, I thought it was proper to affift the plants otherwife as early as I could. They were weeded on the twenty-fecond of Auguft.

" Thefe plants grew fo extremely thick, that their blades covered the ground four feet round, before winter, in fuch manner that the earth could not even be feen through them. The rows were from a foot to a foot and an half high, and the whole had already fpindled, which made me forry I had fowed fo early; fearing left plants fo forward before winter, as thefe were, fhould be killed by the froft; and, in order to fecure fome refource in cafe that fhould happen, I ordered part of the bed to be mowed on the fixth of November, but did not touch the reft. I muft here obferve by the way, that the part which was mowed had feweft ftalks at harveft. At the fame time I gave the alleys their firft plouging before winter. Upon opening a furrow near the rows, I faw fuch a prodigious quantity of long roots, interwoven as it were with one another, that I continued to hope well of the fuccefs.

" Seeing, however, fo many roots uncovered and expofed to the air and froft, I was tempted to fill the furrows up again, in order to preferve them from it: but confidering, that by leaving the furrows open, the part of the bed in which the plants were, and which had not been ploughed, would be much more expofed to the froft, which would then penetrate the earth through its furface, and through both fides of the furrows, whereby it would be greatly divided, and perhaps meliorated more than by ploughing, I preferred leaving the furrows open, and have had no caufe to repent it.

" I confidered too, that fuppofing thefe roots expofed to the air fhould perifh, which was no more than I might reafonably expect, the plants had other roots on their other fide, which, ftill remaining covered with earth, would be fufficient to fupply them with the neceffary nourifhment till fpring.

" After winter, the ploughings were performed in proper weather, and the bed was weeded. I fhall not repeat the detail of thefe operations, either here or in the following experiments. What I faid of them in the year 1753, may fuffice, as they have not been varied fince.

" The plants which I have been fpeaking of, grew amazingly in thicknefs, height, and largenefs of ears. They were reaped on the twenty-fifth of July, and yielded five hundred and forty ounces; which is forty-nine times the feed, and an ounce over. The birds did no damage at all. This is after the rate of 2041 pounds, or thirty-four bufhels to an acre, which is a good crop.

" This experiment amounts to a complete demonftration of the fuperiority of the New Hufbandry. It fhews, beyond all doubt, how much the earth is more perfectly tilled by it, and that this tilth is lafting, if care be taken to preferve it by good culture, performed at proper times, and with judgment.

" Can it be thought that a field cultivated in the old way, will, with only pulling up the ftubble, and without ploughing it feveral times, even though it be harrowed, ever produce a crop of any corn whatever? Part of the feed might indeed fhoot, and the plants might grow fome inches high: but they would certainly perifh for want of nourifhment, which they would not be able to draw from fuch a foil, by reafon of its extreme hardnefs: and confequently they never would be able to produce any grain.

" It was of great importance to fhew, by an unexceptionable experiment, that lands are brought to much better tilth by the New Hufbandry than by the old. This is now completely proved; and no doubt can any longer be made, that the confequence we drew from it is equally certain; viz. that land fo prepared, will produce more than lands which are cultivated in the common way. This fact, which is founded on the principles of found philofophy, is likewife confirmed by repeated experience.

" The partifans of both kinds of hufbandry will do well to confider, that the great principle which we are endeavouring to inculcate, and on which almoft the whole fuccefs of the New Hufbandry depends, is admitted in the Old Hufbandry: viz. thoroughly to divide and loofen the earth. This principle is fo generally received, that there is not a hufbandman who does not know that one ploughing more than ordinary does his land as much good as dunging it would do. His experience has certainly taught him, that this extraordinary ploughing produces him better crops: but he is not fufficiently fenfible, that, of all the ways of improving his land, no one is more effectual, or lefs expenfive than this. Were the full value of it known, it would be practifed more: and every farmer would give all his lands at leaft one ploughing extraordinary.

" What we propofe, is therefore not a novelty capable of giving any hufbandman the leaft diflike to the New Hufbandry. We all proceed upon the fame principle, and agree as to its effect. All of us fay, the earth muft be well divided and thoroughly loofened: but we differ in the manner of doing it. We propofe a method by which the ground is much better prepared than in the old way. In this confifts all the novelty. Whoever rightly confiders it, and compares it with the principles and experiments, will readily receive it; but he that is determined beforehand, not to enter into this examination, will never enjoy the benefits of it, but will continue plodding on in the old beaten

beaten track; not from reafon, but becaufe others did fo before him.

"The advantages of the New Hufbandry are however fo great, that it would be doing the public an injury, not to endeavour to make them more and more known. The fitteft way to anfwer this end, feems to be, to exhort all hufbandmen to convince themfelves, by ftudying the theory of the New Hufbandry, weighing the folidity of its principles, and confulting the experiments which have been already made.

"Every man of common underftanding, cannot but fucceed in the practical part; and his example being imitated by others, the New Hufbandry would foon become the general method."

Experiment, Numb. II.

N. B. This field is marked with the fame number in the journals of 1752 and 1753.

For the crop of 1752, it was fowed with eleven pounds four ounces of wheat, which yielded 1041 pounds twelve ounces.

For the crop of 1753, it was fowed with thirty-four pounds fourteen ounces, which produced 1575 pounds.

For the crop of 1754, it was fowed with fixty-one pounds fourteen ounces, which yielded 1820 pounds.

"This field, which was to be fowed for the third time, having been brought to a good tilth by former ploughings, I prepared it immediately after harveft, by giving it a ploughing like that of the laft year. I found that I had done right, in increafing the quantity of the feed the fecond year; and, upon examining the plants which the earth had nourifhed, it feemed to me that it could yet bear a greater number, and that I might expect a ftill greater crop, by adding to the feed.

"Accordingly, I fowed it on the fixteenth of Auguft, with fixty-one pounds fourteen ounces of very large and perfectly clean wheat, of my own growth. It was the fame as I ufed for fowing all my fields.

"The plants made a very confiderable progrefs after winter, and fhot up greatly, notwithftanding the extraordinary drought. They began to fpindle on the eighteenth of May; they bloffomed on the firft of June; and, being ripe, I cut them down on the tenth of July. They were threfhed a month after harveft, and yielded 1820 pounds of perfectly clean wheat. Thus we fee, that this field produced in 1754, 245 pounds more than in 1753, and 778 pounds four ounces more than in 1752."

Experiment, Numb. III.

N. B. This field is marked with the fame number in the journal of 1753.

"This field, being now in much finer tilth than it was the laft year, would certainly have produced a greater quantity of wheat. However, I refolved to fow it with a foreign wheat, by way of trial. I did fo, and it yielded me fcarce any crop at all.

"I thought it might be of great fervice to try, whether wheat of a different quality from that which we ufually cultivate, would not yield more than even wheat of the growth of our own country. At all events it was right to make this trial, though the wheat which I ufed for it was by no means proper for fowing in our lands. It was Sicilian wheat, the grain of which is very large and extremely hard. I fowed it on the twenty-firft of Auguft. It rofe well; the plants grew very fine before winter, and were extremely thick. But this wheat, being doubtlefs of a much tenderer nature than our common wheat, could not refift the winter's froft, which almoft entirely deftroyed it. Only a few ftrong plants efcaped. Thefe grew exceeding fine, branched greatly, and produced very large ears, which contained more grains than thofe of the wheat of our country. As the plants which furvived the froft were very few, I reaped only about three times the feed."

Remarks on thefe Experiments.

"It is by experience that we can beft judge how far the advantages afcribed to the New Hufbandry are real. The foregoing experiments give rife to two important obfervations.

"The firft experiment fhews us, that lands are brought to much better tilth by the New Hufbandry, and that they will confequently produce much greater crops than in the old way. Experience proves, that they have done fo.

"The fecond experiment offers us the fame proofs, but upon a much larger extent of ground. We have the products of three fucceeding years, and the gradation of their crops. What ought to be particularly attended to here is, that as the internal pores of the earth became more open, the crops became more plentiful, which juftifies what we faid before, that the crops of the fecond, third, and following years, would be greater than that of the firft.

"It was of great confequence to eftablifh this fact, in order to found our calculations of the products upon certain and approved experiments. The following article will afford ftill farther proofs of this truth."

Experiments made on Lands laid out in Beds, and which had borne a fecond Crop. Reflections on thefe Experiments.

Experiment, Numb. IV.

N. B. This field is marked with the fame number in the journal of 1753.

For the crop of 1753, it was fowed with 181 pounds of wheat, which produced 3370 pounds.

For the crop of 1754, it was fowed with 268 pounds fourteen ounces, which produced 4972 pounds eight ounces.

"I muft remind the reader, that this field was fowed in 1753, half in beds, and half in equally diftant rows with the drill-plough. I will fpeak firft of the part that was laid out in beds, which continued to be cultivated in the fame manner for the crop of 1754.

"The ploughings made during the year 1753, had the fame effect upon this land, that is to fay, they loofened and divided it. It was ploughed with eafe after harveft; and the new beds having been formed and well prepared, I fowed them on the feventeenth and eighteenth of Auguft, increafing the quantity of the feed to 268 pounds fourteen ounces of wheat. The plants rofe well, and throve greatly before winter; and in the fpring they made ftrong fhoots.

"The winter frofts, and perhaps fome infects too, had deftroyed fome plants in the rows. I faw plainly by this, that I had done right in increafing the quantity of the feed. Though the year was dry and hot, the wheat grew to a great height, and ripened well. I reaped it between the tenth and fifteenth of July, and threfhed it out in the winter. This crop yielded me 4972 pounds eight ounces; fo that I had this fecond year 1602 pounds eight ounces more than the firft.

"I fhall fhorten what I have to fay of the other half of this field, which was fowed in equally diftant rows for the crop of 1753. After harveft, I made it into beds. But how furprifing was the difference between the mould of thefe two parts of the fame field, even in this fecond year! That which had been formed into beds, was fine and light; but this was fcarcely divided at all; it was full of great hard clods, many of which it was neceffary to break by hand. Though I had not much hope of its yielding any great crop, confidering the condition it was in, I fowed it on the twenty-ninth and thirty-firft of Auguft.

"Thefe beds were but poorly ftocked with plants, which gathered little ftrength before winter, and indeed always remained very weak and ftinted, and, when reaped, yielded ftill lefs than the other half of the field had done in 1753. But if I have not gained any thing by the crop, I have at leaft brought my beds into fuch tilth as affures me of a more plentiful harveft in 1755."

Experiment, Numb. V.

N. B. This field is marked with the fame number in the journal of 1753.

For

For the crop of 1753, it was fowed with 139 pounds, which produced 2205 pounds.

For the crop of 1754, it was fowed with 224 pounds of wheat, which produced 2283 pound.

" The foil of this field was of fuch a nature, as rendered the loofening of it more difficult than that of the experiments Numb. II. and Numb. III. notwithftanding the culture beftowed upon it in the fummer of 1753, which mended it greatly. Still it was not yet in the condition I could have wifhed, when I fowed it on the eighteenth and twentieth of Auguft. I fowed it thicker than it had ever been planted before, merely on account of the badnefs of its tilth. I beftowed upon it 224 pounds of wheat, which rofe pretty well, but afforded fewer plants than that of the fecond experiment. They branched tolerably, and their ears were very fine. I reaped this crop on the nineteenth and twentieth of July, and it yielded 2283 pounds of wheat, which is feventy-eight pounds more than the firft crop in 1753."

EXPERIMENT, Numb. VI.

N. B. This field is marked with the fame number in the journal of 1753.

For the crop of 1753, it was fowed with forty-five pounds of wheat, which produced 724 pounds.

For the crop of 1754, it was fowed with eighty-two pounds of wheat, which produced 798 pounds.

" What I faid of the foregoing experiment may likewife ferve for this. All the circumftances were alike, except that this field was fowed a few days later, viz. on the twenty-feventh of Auguft. It was reaped on the nineteenth of July, and yielded 798 pounds, which is feventy-four pounds more than in 1753."

EXPERIMENT, Numb. VII.

N. B. This field is marked with the fame number in the journal of 1753.

For the crop of 1753, it was fowed, as well in that part of it which was made into beds, as in that which was fowed in equally diftant rows, with 412 pounds of wheat, which produced 2646 pounds.

For the crop of 1754, the whole field was made into beds, and fowed with 360 pounds, which produced 2467 pounds.

" It muft be remembered, that one half of this field had borne a firft crop, and the other a fecond. From what I have already faid, it will be prefumed, that the mould of the new beds was not in fo good condition as that of the others; confequently the former could not be expected to yield fo good a crop.

" This field was fowed on the twenty-firft and twenty-eighth of Auguft. Its whole extent took up 360 pounds of wheat, which yielded a crop of 2467 pounds. At firft fight, it feems to have yielded lefs now than in 1753; but it muft be obferved, that the beds of this field were of two different ages; thofe which now bore their fecond crop yielded more than in 1753; but as the fheaves were not collected feparately, I cannot tell exactly the difference of their produce."

Reflections on the foregoing Experiments.

" I have now given an account of four fields, which produced their fecond crops in 1754, all of which were greater than thofe of 1753, and efpecially that of the fourth experiment. I am fully fatisfied, that their produce was proportioned to the preparation of the foil. This obfervation fhews of what confequence it is to divide and loofen the earth as much as poffible, by deep ploughing, and thorough hoeing, in order to bring it to a perfect tilth, which may certainly be done, and that in a fhort time, by the means which I fhall point out in the following article.

" Neither our intereft, nor the knowledge we would acquire of the products which the New Hufbandry is capable of yielding, fuffer us to reft fatisfied with knowing, for example, what the crop of thefe four fields was the fecond year, and looking upon that as the moft they will ever produce. We ought likewife to examine, whether their crop was not diminifhed by caufes which we can account for, and which we may reafonably hope will not take place in other years.

" By this examination we fhall find, that the year was not a good one for great crops of wheat. There was not rain enough; the corn grew thin, and yielded but few fheaves. The ears were indeed full of grain, but the quantity was not fufficient to make amends for the thinnefs of the crop.

" The wheat was rufted in autumn; and though this diftemper fhewed itfelf in that feafon, in which I think it does the plants leaft hurt, yet it prevented their branching, fo much as they would otherwife have done the next fpring. I obferved exactly, that the thinneft places were thofe where the ruft had prevailed moft. Laftly, the frofts which happened in March, did great damage to the wheat. It is therefore not to be wondered at, that the crop was not greater. I hope, and I flatter myfelf, not without foundation, that the fame fields will produce better crops in years exempted from fuch accidents.

" I do not pretend that the New Hufbandry can fecure corn from the effects of all thefe accidents: but I have experienced that the crops cultivated in this manner have fuffered lefs from the intemperature of the feafons, than thofe which have been raifed in the common way: for inftance, they will fuffer lefs by a great drought, or even not be at all affected by it, if dews fall, which penetrate the well-loofened earth; as I have conftantly obferved: and befides this, the roots of the corn in the new way, being much longer, will extend to a confiderably greater depth in ground that has been ploughed deeper, and will find a moifture there, which corn in the common way is deprived off."

EXPERIMENTS *made on Lands laid out in Beds which had borne a firft Crop: with an Account of the Manner in which they were tilled, to prepare them for fowing. Remarks on thefe Experiments.*

" The firft crops of all my fields laid out in beds have hitherto been but fmall. I eafily difcovered that this was owing to two principal caufes, independent of the intemperature of the feafons. The firft was, that I fowed too little feed at firft, and that the quantity was not fufficient to fuftain the accidents which befel my wheat, without being confiderably diminifhed thereby. This I remedied afterwards, by increafing the quantity of the feed; which I have continued to do by little and little, from year to year, in proportion to the condition and quality of my land.

" The fecond caufe was the bad condition of my lands, which could not be fufficiently loofened and divided in fo fhort a time, and therefore did not afford the plants the quantity of nourifhment neceffary to enable them to produce plenty of grain.

" I was in hopes that, by continuing my ploughings, I fhould have better fuccefs the following years: that is to fay, that I fhould bring my land to a loofer ftate, and that if I gained that point, the crops would certainly be greater afterwards.

" Encouraged by this expectation, and provided with my plough and cultivators, I made no doubt of fucceeding. To this end, I refolved to multiply the ploughings: and certainly no one ought ever to hefitate fo to do, even in the common hufbandry; fo great have been the effects produced threby.

" I have often reflected on this paffage in Mr. Duhamel's Treatife of the Culture of Land: One of the prefident Montefquieu's farmers reaped a great crop of Spanifh wheat, from his farm near Clairac, at a time when all his neighbours had very bad crops. The prefident afked him, what he had done to have fuch extraordinary fuccefs. The farmer anfwered, that he had given his ground eleven ploughings between feed-time and harveft; and that, by this means, it had reaped the benefit of all the rains, dews, fogs, &c. whilft the lands of his neighbours were not at all bettered by them, on account of a dry hard cruft which grew over their grounds, for want of ploughing. This

obfervation

obſervation agrees perfectly with the principles on which the New Huſbandry is founded.

" This ſhews us that an active, intelligent, and induſtrious farmer, will always reap the fruit of his labour and expence. But without pretending to ſay that land ought to be ploughed quite ſo many times, we learn from this example, that it would be greatly for the public good, to plough it oftener than is generally practiſed.

" I multiplied my ploughings, in the ſpring, and till ſeed-time. I gave my land ſix ploughings in all: but I aſcribe the great benefit which I received, chiefly to the manner in which thoſe ploughings were performed, and to which I beg the reader ſeriouſly to attend.

" After the beds were formed, my method was this. I changed their poſition, by removing the middle of the beds to the place where the great furrow in the middle of the alley was before; or, to explain myſelf ſtill better, I then performed the ſame ploughing as we do after the firſt crop is reaped.

" This operation is of ſuch importance, that it requires my being ſtill more explicit. I ſhall therefore relate the whole proceſs of the preparation of my land. In the firſt place, I ploughed it twice, as deep as I poſſibly could, in broad lands. The beds were formed at the third ploughing. I afterwards gave a fourth ploughing, to raiſe them ſtill higher, by opening the firſt furrow in the middle, or higheſt part of the beds, and turning the earth on both ſides up againſt that middle, by which means the beds were arched very high, and a great furrow was left in the middle of the alleys. I went farther yet; and this I ought to reckon as a ſeventh operation: I cut the great furrow in the middle of the alley ſtill deeper, with one turn of my cultivator with two mould-boards.

" The beds thus prepared were certainly in excellent order for ſowing: I never had them in ſo good condition before: but I was willing to go ſtill farther, and that for the following reaſon.

" I had obſerved, that there is always a greater depth of fine mould in the middle of the bed, when it is placed in the ſpace before occupied by the main furrow in the middle of the alley. My beds were not diſpoſed in this manner till the ſecond year.

" I therefore thought it adviſeable to change the place of the beds, I did ſo, at the fifth ploughing, by filling up the great furrow, which now became the middle of the new bed. As the earth was in a very looſe ſtate, a great deal of it was heaped up by each turn of the plough, with eaſe to the horſes, and with ſpeed. The middle of the beds was raiſed as much as might have been thought neceſſary: but I raiſed it ſtill higher, at the ſixth and laſt ploughing, by cutting the firſt furrow in the middle of the bed, and turning the earth up from right and left towards it.

" By theſe ploughings, the mould of the beds will be admirably well prepared even the firſt year, and the ſeed ſowed therein will not fail to vegetate very abundantly. It is by this means that I have brought the middle of my beds to the depth of fifteen or eighteen inches of fine looſe mould, in which the perpendicular roots of the plants extend themſelves, and multiply eaſily, and find plenty of nouriſhment, which they afterwards tranſmit to the plants themſelves.

" I ſhall mention farther, as a proof of the fineneſs to which theſe ploughings brought the earth, that I was not obliged to harrow my beds before I ſowed them.

" Some may perhaps object, that all this requires much labour, great trouble, and conſiderable expence: and how, will it be added, can one find time for ſo many ploughings?

" To this I anſwer: firſt, that allowing all this to be true, the crop will make ample amends for it. What follows will eſtabliſh this truth beyond all doubt.

" Secondly, that this labour ought not to diſcourage any one. The four firſt ploughings are abſolutely neceſſary, as all will agree: and the fifth and ſixth are performed with ſuch eaſe, and in ſo much leſs time than the common ploughings, and eſpecially the laſt, for which one horſe will generally be ſufficient, that it will eaſily be perceived I do not propoſe a thing either too difficult or too expenſive to execute.

" The fields of the three experiments of this article, were prepared in the manner I have now related.

Experiment, Numb. VIII.

" The ſoil of this field is very good and ſtrong. Its extent is one acre and twelve poles. I made the beds about ſix feet wide; and each bed was ſowed with two turns of the drill-plough, which were to make ſix rows: but the difficulty of guiding the plough ſo as to keep the three laſt rows exactly parallel to the three firſt, was ſo great, that the two middle rows were frequently jumbled together, ſo that there were in fact but five rows in ſome places. The ſpace which remained between the outer row of one bed, and the outer row of the next bed, left an alley wide enough to be ploughed. I muſt obſerve that our farmers hereabouts liked this way of ſowing much better than the firſt, in which I likewiſe made the beds ſix feet wide, and ſowed them with only three rows.

" I ſowed each row a little thinner than in the former experiments: but as there were more of them in each bed, they would of courſe require a greater quantity of ſeed. This field was ſowed on the 27th of Auguſt, with ſeventy-ſix pounds eight ounces of wheat.

" All my plants were equally fine till winter, and ſhot up with great vigour in the ſpring. They grew exceeding high, branched abundantly, and produced very large ears, among which there was but little difference. This crop was reaped on the 7th of July, and yielded 1462 pounds of wheat.

" This produce made me good amends for the labour I had beſtowed upon the ground. It is after the rate of about 1500 pounds, or twenty-five buſhels to an acre.

Experiment, Numb. IX.

" This field is of a very indifferent quality, and had hitherto yielded but ſmall crops. Its extent is four acres, three roods, eight poles, and nine feet. It was ſowed on the ſeventh and eighth of Auguſt, in the ſame manner as the former, with 249 pounds twelve ounces of wheat.

" The young plants ſhot up as thick, and looked as ſtrong and of as good a colour, as thoſe of the foregoing experiment: but the ruſt took them all in October and November; and their blades, which were of the fineſt green before, turned yellow, and perfectly covered the ground with the powder of this ruſt. My plants ſuffered greatly by this accident. They branched imperfectly, and conſequently grew very thin. Their ſtalks were, however, long, and bore fine ears. They were reaped on the 8th of July, and yielded 2925 pounds of wheat.

Experiment, Numb. X.

" The ſoil of this field is rather inferior, than equal to that of the field we ſpoke of laſt, whoſe fate it likewiſe ſuffered in every reſpect. The young plants were extremely fine, and, in October and November, they were ruſted almoſt as much as the others. This field contains three acres, three roods, and nine poles. As I thought this land inferior to the other, I ſowed it thicker; uſing to this end 294 pounds of wheat. It was ſowed on the 8th, 17th, and 28th of Auguſt; not being able to do it in any three days running. The crop yielded 3055 pounds.

Remarks on theſe Experiments.

" I have now been able to obtain better crops, even the firſt year, by the New Huſbandry, than any I ever had before. I think there can be no doubt but that this ſucceſs is owing firſt, and chiefly, to the better preparation of the ground; and ſecondly, to a proper increaſe of the ſeed. Upon the whole, I am inclined to think, that the ſowing each bed with two turns of the drill-plough increaſed the crop. But of that I ſay no more at preſent, as I intend to treat expreſly of it in the eighth article.

" All my obſervations ſhew, how much I am convinced of the importance of bringing the earth to a fine looſe ſtate: nor can I recommend it too ſtrongly. I have ſenſibly experienced the good effects of it in all my lands, and particularly in thoſe of the ninth and tenth experiments; for, though theſe fields are but of an indifferent quality, they have produced plants equal to thoſe of my very beſt lands.

" After what I have now faid, no one will be furprifed that almoft all my firft crops were but fmall, fince moft of the lands were fown after a fingle ploughing, which was not fufficient to prepare them properly. I was indeed well apprifed of this defect at my firft fetting out: but all I then aimed at was, to lay all my fields into beds as foon as poffible; being thoroughly fatisfied that it would not be long after, before I fhould be able to bring them to a proper tilth, with great eafe and little coft.

" Thefe three experiments not only fhew us how to conduct our works more profitably hereafter; but they likewife difcover a new advantage in this hufbandry, which indeed I fufpected from my very firft experiments. It is of importance to take notice of it here.

" All the experiments made by different perfons, and in different places, have fhewn us, that wheat cultivated according to the New Hufbandry is very little apt to lodge; that the great ftrength of its ftalk fupports it, and that it refifts the force of the wind much better than that which is raifed after the common method, the ftalks of which almoft always give way in ftormy weather.

" It muft however be acknowledged, that the wheat of the new culture is not abfolutely able to refift extremely violent winds accompanied with great rain. But would any one expect that the accident I am now going to fpeaking of, far from hurting the wheat, feemed to me to be of great fervice to it, particularly in very rainy years, or when cold dews fall about the time of its ripening?

" I obferved, in the account of my experiments in 1752, that my wheat was not lodged; but that fome of it was bent, without fuffering any damage thereby. I added, that I imagined it might be of fervice to the wheat not to remain always in an exactly perpendicular fituation. I purpofed watching clofely what effect the fituation of this would have. I could not be fatisfied in this in 1753; but the year 1754 furnifhed me with obfervations, and afforded me advantages with refpect to the quality of wheat, which it is always of very great fervice to know.

" Wheat grows and fhoots up pretty perpendicularly, without altering this direction, unlefs it meets with fome obftacle. The moft formidable is a violent wind, accompanied with great and heavy rains, which lodge it. Every one knows, that when wheat is lodged foon after it has done bloffoming, it yields fcarce any grain; and that what it does yield, is very fmall and fhrivelled, and contains very little flour: a manifeft, and oftentimes very confiderable lofs.

" The wheat which is only bent, continues to grow in that fituation: its ears fwell and fill equally with grain to the very point, abounding plentifully with good and very nourifhing flour. Thus no lofs is fuftained in this cafe; and this inclined fituation of the ftalk does not at all interrupt the functions of the nutritive juices, as in wheat which is lodged. The growth of the plants in this fituation proves plainly that their vegetation is not ftopt.

" This bending of the ftalks no way hinders a fkilful and careful hufbandman from giving another ploughing, if it be neceffary. I had it done in the field of the eighth experiment, without deftroying or hurting a fingle ear.

" All the beds of the three fields on which the experiments mentioned in this article were made, are in the fame direction, viz. from eaft to weft, and lie fomewhat floping towards the weft. Soon after the wheat had done bloffoming, a ftrong fouth wind blew for fome hours, accompanied with a heavy rain, which made all the wheat of thefe three fields incline towards the north. It remained in this fituation till harveft, and the ftalks grew fo crooked that the points of the ears turned down towards the ground: they remained thus fufpended, by the ftrength of the ftalks, which feemed even to increafe; for I did not find that they bent any more, though the weight of the ear increafed as the grain grew riper.

" In this fituation, this wheat continued to profper: the ears filled with grain to the very point: they grew as large and heavy as thofe of the other fields; and had befides the advantage of being of a finer colour. This quality helps corn to fell fooner and more eafily, becaufe the buyer judges by his fight more than by his other fenfes. It is of confequence in all forts of goods, to catch the eye; but there is no fear of its deceiving one in the choice of wheat: the good colour of the grain is always a fure fign of its foundnefs, and invites the purchafer to buy it with confidence.

" Since then there is no fear that any damage will arife from wheat's being bent, there is no caufe to repine or be uneafy at feeing it in that fituation. But, befides what I have been faying, I muft now offer fome reafons why I think it may perhaps be better for wheat to be bent and curved in that manner, than for it to grow almoft quite upright.

" Let us confider what effect rain, the moifture of the air, and dews have upon the ears of corn in both thefe fituations. When the ears ftand upright, and almoft perpendicular, they retain a great deal of wet in rainy and dewy weather. This wet infinuates itfelf very eafily between the hufks which cover the grain, and gets even into the infide of them. This water, thus got within them, remains there, and does not evaporate fo eafily as that which is only upon the outer furface of the hufks, which the motion of the air or the fun diffipates in a fhort time.

" It may happen too, but I fhall not give it as a fact which I have yet fufficiently obferved, that the water which has penetrated between the hufks, touches immediately the grain itfelf. Now this moifture all around it, in whatever manner it gets there, muft certainly be very prejudicial to the grain; and the longer it ftays there, the more hurt it muft do. We have feen fuch continual rains in fome years, that, for feveral days together, even the outfide of the ears could not be wiped dry, but they have remained wet fo long, that the corn has fprouted while it ftood upon the ground. But, without fuppofing the mifchief to be always fo great, wet, by remaining too long upon the grain, may, in fome meafure, ruft it a little, as it rufts ftraw while ftanding. I have feen this happen, though indeed but feldom.

" The imperfection which is often found in the quality of the grains, and their fometimes lefs pleafing tafte, may, with great probability, be imputed to this cafe: and perhaps it may be found upon ftricter inquiries than thofe I have hitherto been able to make, that the moifture too long retained around the grain, towards the latter end of its growth, and particularly that of cold dews, is the real caufe of the fatal and fudden changes which often befall wheat in grain, a little before harveft, and rob us of the beft part of a crop which was juft before thought to be quite out of danger.

" When the wheat is inclined, its ftalks bent downwards arch-wife, and the point of the ears turned towards the ground, it is plain that no wet, either of rain or dews, can fo eafily get at the grain, and that only the outer furface of the hufks will be immediately touched by it: the water, not being able in this fituation to glide in between the interftices of the hufks, will drip down from one hufk to another till it comes to the point, and then will fall to the ground. Thefe hufks are foon dried again; and the ears which grow in this manner are much lefs expofed to the confequences of the wet, than thofe which remain in a perpendicular fituation; and confequently their grain ought to be better conditioned.

" This advantage can be enjoyed only in the New Hufbandry; for in the old way, the wheat is either lodged quite flat, or ftands quite upright; fcarce any of its ftalks are ftrong enough to fupport the fmall weight of the ear, when bent and inclined towards the earth.

Experiments made on Lands laid out in Beds, which have borne a firft and fecond Crop, together with fome interefting Obfervations.

Experiment, Numb. XI.

" In the journal of 1753, I gave an account of the experiments which a perfon had made upon about twenty-eight acres laid out in beds about fix feet wide, and which did not meet with the defired fuccefs. I added, that the fame perfon, perfuaded neverthelefs of the advantages of this culture, had prepared twenty-five acres more in the fame manner, and that all of them were fown for the crop of 1754.

" All

" All this ground was ploughed with care, and part of it was ſown earlier than the year before. Some little addition was likewiſe made to the quantity of the ſeed. The plants in general roſe extremely well, and were ſtrong and healthy before winter, in proportion to the time of their being ſown, and to the quality and condition of the land.

" Such a beginning gave room to hope, that theſe fields would yield a pretty good crop; but the winter ruined all; and ſcarce any thing was reaped from ſo large an extent of ground.

Obſervations on this Experiment.

" It would have been unfair in me not to mention this experiment, though it anſwered ſo badly. The reader may be ſurpriſed at firſt to ſee ſo great a contraſt between this and my own experiments, in which, notwithſtanding the intemperature of the ſeaſons, and other accidents, he finds the crops increaſe as the land becomes better tilled, according to the principles of the New Huſbandry. This increaſe was what we foretold would happen; but the field we are now ſpeaking of, produced leſs the ſecond year than it did the firſt, though even that was very little.

" There muſt then neceſſarily have been ſome differences between theſe fields, to which this great diſparity of their corps was owing. Theſe differences doubtleſs were, either in the quality of the ſoils, the preparation of them, their expoſition, the quantity of the ſeed, the accidents that befel them, which might be greater or leſs in ſome than in others; or, in ſhort, many other cauſes capable of helping or hurting the crop; for otherwiſe, ſuppoſing all theſe things to be equal, or nearly ſo, the diſparity in their crops would not have been great.

" Not to impute the bad ſucceſs of this laſt experiment too lightly to the New Huſbandry, we ought in juſtice to examine, whether it might not be owing to ſome other cauſe, and whether there may not be room to hope for better ſucceſs another time.

" Theſe fields, without being all exactly of the ſame quality, are generally reputed, in the country, cold and ſtiff lands, and very apt to grow hard. Such lands will certainly require more time, more patience, and more perſeverance, to bring them to any degree of tilth; more ploughings will be neceſſary, and thoſe ploughings muſt be given in the moſt proper ſeaſons. By continuing to ſtir them well, their hardneſs and reſiſtance will be overcome, their pores will be opened and multiplied, and plants will then thrive in them as well as in the beſt of ſoils.

" All lands ought to be treated according to their reſpective qualities. There is great reaſon to believe, that this field, when prepared as thoſe of the experiments Numb. VIII. IX. and X. were, will hereafter produce great plenty of corn. What I now ſay, is not mere conjecture. Repeated experiments, the effects of which have been conſtantly the ſame, have taught me, and I can ſafely affirm, that extremely bad lands, which could not ſo much as yield a crop that would pay the expence of tilling them, have been rendered good and fertile merely by ploughing, and without the aſſiſtance of any manure.

" This is a ſtriking truth. It was what firſt determined me to practiſe the New Huſbandry; and therefore it was of conſequence to me to be certain of it. To this end, I reſolved to make a trial upon a ſmall ſpot of ground, which I knew to be incapable of producing any thing in its then ſtate.

" Some years before I had dug away the earth three feet deep, from a ſpace of 360 feet ſquare. Nothing remained in it but a cloſe white clay, fit for potter's uſe. This ſpot, thus circumſtanced, ſeemed to me a proper one for my experiment. As the ſpace was too ſmall for the plough to work in, I made uſe of the ſpade and hoe. It was made into beds, which were afterwards ſown with wheat, and the ſpaces between them were frequently ſtirred. The firſt year my plants were very poor, and branched into only two, three, or four ſtalks apiece. The ſecond year they did much better; and the third year they were as large and fine as any my garden could have produced. This ſpot ſtill continues to produce equally well.

" We have here a remarkable inſtance of what may be done by ſufficiently pulveriſing the earth: that which I am ſpeaking of is now like mould; and, which is very remarkable, it has loſt its former white colour, and now is black. Let us but do the ſame with any of our bad lands, and perſevere in ploughing and ſtirring them a ſufficient time, the ſucceſs will not be doubtful.

" But to return to the ſubject of this article. Some of the fields we were ſpeaking of are ſurrounded by, or border upon woods. This ſituation is far from being good, and it ſeldom happens, but that ſuch a neighbourhood does great injury to the crops.

" I could likewiſe have wiſhed, that a larger quantity of ſeed had been employed to ſow theſe fields. The loſs occaſioned by the froſt might have been leſſened thereby, as it may be preſumed that a greater number of plants would have eſcaped, if they had been thicker in the places where all of them were not intirely deſtroyed.

" We obſerved before, that the young plants were in a fine condition before winter, and that they promiſed well: but the ſeverity of the froſts, doubtleſs too great for the condition and ſituation of theſe lands, did an irreparable injury to almoſt all theſe fields.

" I examined the greateſt part of them in the beginning of the ſpring. Of all thoſe which I ſaw, I found but one ſpot, of three or four acres, where the earth was in the condition it ought to be, that is, well ſtirred and broken, looſe, light, and penetrable. Too few plants were left in this good ſpot: large ſpaces were quite empty in moſt of the rows: but thoſe which reſiſted grew very fine in the ſummer, branched extremely well, and bore fine ears.

" By this one might gueſs what theſe lands were capable of. My opinion is, that, in other years, free from ſuch accidents, the rows will remain well ſtocked with plants, which, finding an equal plenty of nouriſhment, will be nearly of equal ſtrength and beauty in every part, and, altogether, will produce a conſiderable quantity of corn.

" The other fields were infinitely worſe treated. Every thing was deſtroyed for ſeveral acres together. The plants were rooted up by the ſtrength of the froſt, and lay ſcattered upon the ground all along the rows, withered and unable to recover the leaſt vigour. Theſe are the only fields laid out in beds, in which I have ſeen this extraordinary accident; not a plant was rooted up any where elſe. It is very difficult not to ſuſpect, that there muſt have been ſome fault in the ſowing, and that the ſeed, perhaps, was not buried deep enough. The roots which were too near the ſurface of the earth, were nipped by the froſt. They muſt have been ſo, ſuppoſing them to be but about two inches deep. We likewiſe know, with certainty, that if the ſeed had been ſown in good time, the plants would have had roots above ſix inches long; and that ſuch roots would have ſecured them from being killed by the froſt. There is room therefore to believe, that the ſeed was not buried deep enough.

" But even ſuppoſing the plants not to have been deſtroyed, I doubt whether they would have yielded a good crop, becauſe the ground, eſpecially that of the partitions between the rows, was extremely hard and cloſe, and therefore quite unfit to ſupply the plants with their neceſſary nouriſhment.

" This experiment required theſe remarks: many more might be added; but theſe are ſufficient to ſhew, that ſome lands require a double portion of care and labour.

Experiment, Numb. XII.

" The account of the ninth experiment in 1753, promiſed better ſucceſs the next year. The whole culture was performed by the ſame perſon, with great care and extraordinary judgment, in two fields, containing about ten acres. One of theſe fields is much better than the other; the beds were about ſix feet wide; one half of the worſt field was dunged; but not above a third part as much as it would have been in the common way. The ſoil of this field is very ſtiff. It had not been ploughed for fifteen or twenty years, and was not yet sufficiently loosened and divided.

" It was sowed early: the plants rose very well, but were greatly hurt by the frost, excepting those which the dung preserved. The same thing happened to the beds which were sown with six rows.

" The soil of the other field is richer, and of a better quality. The winter did it little hurt. The plants throve by the culture which was given them, but less than was expected, owing, as is supposed, to the great drought of the season. These two fields produced, however, about 7000 pounds of wheat, which is extremely well, especially for a first crop.

" These two fields have given us room to make two reflections: first, That the earth must be well prepared, without which the plants are not able to extend their roots to the ploughed part of the alleys. Secondly, That in dry springs, the plants of wheat preserve one another mutually from the drought, for which reason it is proper to sow somewhat more than would otherwise be necessary.

" The same culture is now practised for the year 1755, and is extended to about fifteen acres more.

Experiment, Numb. XIII.

" I mention this experiment on account of the faults committed by the husbandman, in order that others may take care to avoid them. Near three acres of pretty well ploughed land, made into beds, produced only about 780 pounds of wheat the second year.

" The reasons why this crop was so scanty are evident. In the first place, too little seed was sowed; there ought to have been three times the quantity. Secondly, the beds were of an excessive breadth, all of them being eight or nine feet wide, and sown with only three rows. By this means great part of the ground was lost, which ought carefully to be avoided.

" The ploughings too were made in a very slovenly manner; the husbandman gave them, not when they were necessary, but when it suited his convenience. The reason was, that he was prejudiced against the New Husbandry, and did not desire to see it succeed."

Experiments made by several Lovers of Agriculture, on Lands sown in equally distant Rows with the Drill-plough.

" Some of the principles of the New Husbandry have been adopted in this way of sowing; and even the common ploughing is now performed with more care than it was before the great advantage of thoroughly dividing and breaking the earth was so well known. This method of sowing the land all over in equally distant rows, being, in appearance, easier and more simple than forming it into beds, has now a great number of partizans; and indeed the lands which have been sown in this manner, have yielded much better crops than the fields cultivated in the old way.

Experiment, Numb. XIV.

" It is pretty generally the custom about Geneva, if the land is good, to sow it in April, over the wheat, with clover seed, which yields a crop the next year. Agreeable to this custom, a field of about three acres was sowed with clover in April, 1752. In 1753, it yielded two crops of clover, after which the owner of the ground gave it three good ploughings in the common way. The clods which the plough had left, were broken by hand before the field was sowed; for he was determined not to spare any pains to give it a good preparation.

" About 630 pounds of wheat used generally to be employed to sow this field; but it was now sown on the fourteenth of September, with only 315 pounds. The earth was extremely dry, and the weather very hot, which it continued to be for ten days longer; circumstances which ought to be attended to, and which it will be proper the reader should remember when he comes to the continuation of this experiment in the seventh article.

" This field was plentifully stocked with plants. They yielded 2926 pounds of wheat. In proportion to the produce of the other fields of the same farm, this would have yielded at most only between 18 and 1900 pounds: consequently here is a gain of about 1026 pounds, besides 315 pounds saved in the seed, which makes in all a profit of 1341 pounds.

Experiment, Numb. XV.

" The same person who made the experiments Numb. VII. in 1752, and Numb. X. and XI. in 1753, continued them in comparison with the Old Husbandry. They answered as before, and the same advantages were again confirmed. A detail of the particulars would be needless. I shall only add, that barley, with which the experiment was likewise tried, answered much beyond any thing that was expected, and yielded a prodigious crop.

" The farmer, convinced by such success, of the superiority of the New Husbandry over the Old, immediately desired his landlord not to make any more experiments by way of comparison, but to let him sow all his lands with the drill-plough.

Experiment, Numb. XVI.

" This experiment was made in the same farm where the XIII. and XIV. were made in 1753. All the lands were very well prepared, and sowed with the drill-plough.

" One of these fields, containing about four acres, which used to require 880 pounds of seed, was now sowed with 315 pounds. The plants were extremely fine, both before and after winter, and, when reaped, yielded 4940 pounds of wheat. If it had been sown in the common way, it could not have been expected to yield above 2900 or 3000 pounds; consequently it now produced 1940 pounds more; to which if we add 565 pounds saved in the seed, we shall have 2505 pounds of wheat more by the new, than would have been obtained by the old husbandry.

" Another field, of an inferior quality, the extent of which is near nine acres, used, in the old way, to be sown with 1764 pounds of wheat, and was now sowed with only 819 pounds, which produced about 5720 pounds. Though the difference in the goodness of the lands is considerable, yet the drill-plough still maintains it's superiority: for, if this field had been sowed in the common way, it would have been thought to have produced an exceeding good crop, if it had yielded between 5200 and 5300 pounds, though that would have been 420 pounds less than this, which, added to the 935 pounds saved in the seed, make this crop 1355 pounds greater than it would have been in the old way.

" A small spot, of about an acre and a quarter, which used commonly to be sowed with 157 pounds of wheat, was sowed with sixty-three pounds, and produced about 430 pounds. This is nearly the same proportion as the foregoing experiment.

" These fields, being some better than others, may serve to shew what may be expected from lands of different qualities.

" A piece of ground of thirty acres was likewise plowed with care. This, to have sowed it in the old way, would have required about 6550 pounds of seed, which would have yielded at most 20000 pounds. I even think that I over-rate it in this.

" These thirty acres were sown with 2772 pounds of wheat. Here is, in the first place, a saving of 3778 pounds in the seed, which is a very considerable object. The whole crop yielded about 19000 pounds, which added to the 3778 pounds saved in the seed, make 22778 pounds. The profit therefore is 2278 pounds more in the new way, than in the old.

" To set this experiment in a yet clearer light, I shall add, that the sheaves were strong, the straw fine, the grain very clean and plump, and that half these fields had suffered considerably by the frosts in March.

" The produce of a few detached pieces of land might not have been sufficient to persuade the generality of mankind, so much as to adopt even this change, which consists solely in the manner of sowing the ground. They might still think it imprudent to give up a certain profit for an uncertain one. It will therefore be proper to let them see, by the management of a whole farm, that this husbandry may be practised to very great advantage. This will be shewn in the following article.

Expe-

EXPERIMENT, Numb. XVII.

"This experiment, which is a very confiderable one, was executed on the fame perfon's land, who made the experiment Numb. 12, in 1753. All the lands were fown with the drill-plough. They were plowed four times, and a fmall part of the whole was dunged. I cannot enter into all the details of this operation; but the general refults, which we fhall give, will be fufficient.

"The lands of which we are fpeaking, compofe three farms, fituated in three different villages, about a mile and a half afunder. Thefe lands are of different qualities; fome ftiff, others pretty light, others of a middling quality, and but little ftony.

"About 100 acres were cultivated in the firft farm, forty in the fecond, and forty likewife in the third. In all 180 acres.

		Pounds.	
The quantity of feed ufed in the common way, was,	For the firft farm, fowed in Auguft and September	21420	of wheat
	For the fecond farm, fowed between the 1ft and 15th of October	8190	
	For the third farm, fowed between the 20th and 30th of October	8190	
	In all	37800	

		Pounds.	
The quantity of feed fown with the drill-plough was,	For the firft farm	8190	of wheat.
	For the fecond farm	3276	
	For the third farm	3276	
	In all	14742	
	Saved in the feed	23058	
	Total	37800	

		Pounds.	
Crops in 1754.	Firft farm	70200	of wheat.
	Second farm	22750	
	Third farm	15210	
	Total crop	108160	
	To which muft be added the faving in the feed	23058	
	The whole profit is	lb. 131218	of wheat.

"It will be right to fee now what the fame extent of land might poffibly have produced, if it had been cultivated in the old way. This can indeed only be gueffed at, and I chufe therein to favour the Old Hufbandry. According to the general run of this year's crops, thefe three farms would have produced, at moft, about 95000, or 100000 pounds of wheat; which would confequently have been 31218 pounds fhort of what they yielded in the New Hufbandry.

"This way of ftating the account of the produce of both methods, is a fair one. The faving in the feed is always to be reckoned. But I have perceived, by the queftions which feveral perfons have afked me with regard to accounts thus ftated, that they were not clearly underftood. I fhall therefore throw them into another form, which has been thought more diftinct, but of which the refults will ftill be the fame.

"We will reckon only the real and actual produce, and then fubftract the feed: the remainder will confequently be the neat produce.

NEW METHOD.

Total produce	108160 lb.
To be deducted for the feed	14742 lb.
Neat produce	93418 lb.

OLD METHOD.

Total produce	100000 lb.
To be deducted for the feed	37800 lb.
Neat produce	62200 lb.
"Therefore the new method produced more than the old would have done	31218 lb.
Proof	93418 lb.

"Which refult is the fame as that of the other comparifon.

"Are not fuch advantages well worthy the attention of every one concerned in hufbandry?

EXPERIMENT, Numb. XVIII.

"We faw by the fifteenth experiment in 1753, that the fields which I had fowed, with the drill-plough, in equally diftant rows, yielded very little corn. I mentioned the caufes, which I knew. I have not yet had time to form them into beds, by which means I fhall certainly remedy the too great cohefion of the foil, and without which thofe lands will never yield any other than poor crops, as they have almoft always done whilft cultivated in the old way, which is infinitely lefs fit for lands that require a great deal of ftirring, than for fuch as are naturally fruitful.

"I hope I fhall be able to begin next year to practife the New Hufbandry in this farm. I fhould have done it before now, if I could have made any ftay there: but as I could not, I have only continued to fow it with the drill-plough in equally diftant rows.

"I fhall mention another fmall farm, on which no dung or any other kind of manure was ufed, though it's lands, at leaft the greateft part of them, are but very indifferent.

"I fowed thefe lands towards the end of Auguft and the beginning of September, in pretty hot and dry weather. The whole extent of this little farm is between twenty-two and twenty-three acres, which ufed to take up 4662 pounds of feed: but only 1950 pounds were employed now.

"Some places looked well enough: but in general the wheat came up thin. I was however very well fatisfied with my crop, which yielded about 13000 pounds of exceeding fine wheat, fo clean that it wanted no fifting. If I had not fowed with the drill-plough, I fhould fcarcely have reaped more than barely the feed: for that was the cafe with all my neighbours, who had only about their feed and half as much over; and many of their crops yielded ftill lefs. It is not to be fuppofed that I fhould have fared better than them, if I had followed the old way, as they did."

Summary Accounts of the Products of feveral Pieces of Land fowed in equally diftant Rows with the Drill-Plough.

EXPERIMENT, Numb. XIX.

"As nothing but a great number of experiments, repeated under different circumftances and in different places, can convince many of the advantages of the new hufbandry; I am the more readily induced to mention all that have come to my knowledge; though there are among them feveral of which I have not been able to get fo particular a detail as I could have wifhed: all that has been told me in relation to many of them being, that thofe who made them were well fatisfied with the crops they had obtained by means of the drill-plough, and that they intended to continue ufing it: but the following experiments will merit the reader's attention.

"The lands I am going to fpeak of are fituated in a diftrict of near thirty fquare miles, and there are great differences in their qualities and fituations; they were not all plowed with equal care: fome of them were dunged, and others were not; and laftly, the drought was greater in fome places than in others. Notwithftanding all thefe diverfities, it will appear from what we are going to fay, that the ufe of the drill-plough was every where attended with uncommon fuccefs.

"To ſhorten, and at the ſame time give the reader a full view of the purport of this article, I have drawn up a table of the extent of the ſeveral pieces of land, the quantity of ſeed uſed for ſowing them in the old way, the quantity they were ſown with in the New Huſbandry, and their produce in this laſt culture. Though theſe experiments are not related ſo exactly as my own, I am ſure there is no miſtake of any conſequence in them.

"I ſhould have been very glad to have known likewiſe the exact products of the crops in the old way. I have done all I could to come at the knowledge of them, but have obtained only very few ſatisfactory accounts. All that I have been able to learn, amounts only to a confirmation of what I found in my accounts of the culture and produce of my own eſtate; of which an exact account has been kept for about forty years paſt. Beyond that time, my papers furniſh me with only the produce of now and then a year, but not of any number of years together. Theſe detached hints have however afforded me ſome curious and uſeful knowledge. For example, I have learnt by them, that the produce of land was the ſame in the laſt age as it is in this. In the year 1668, which is the fartheſt back that any of my papers take notice of, I find that the crops were like thoſe which the ſame lands have yielded for theſe laſt thirty or forty years.

"All my inquiries have ſhewn me that, in this country, in what are reckoned good years, the lands yield but three times the ſeed; ſeldom more, and often leſs. Some few fields indeed muſt be excepted, which, being of a very extraordinary goodneſs, do produce more: and likewiſe, on the other hand, ſome very bad lands which do not yield ſo much: ſo that, upon the whole, this may be reckoned the medium crop during any number of years.

"The neat produce does not by any means amount to the whole of the crop, in the common huſbandry: for the good grain is frequently ſo mixed with bad, and with the ſeeds of weeds, that it ſuffers a conſiderable diminution thereby. The quantity of perfect grain is therefore what ought to be conſidered: and in this many are apt to deceive themſelves. Whenever people become ſenſible of the ſmall advantage of the common huſbandry, they will be more ready to attend to what is ſaid in favour of the new, and will be inclined to verify it by their own experience. When ſo convinced, they will endeavour to overcome the diſlike which moſt farmers have to this new method. They are, in general, a ſet of men, fit only to execute what they are bid to do; and therefore ought to be directed by perſons of better underſtanding. Patience and perſeverance may by degrees induce them to practiſe the New Huſbandry, which time will bring to its greateſt perfection.

"The following table will help to ſtrengthen theſe reflections."

T A B L E.

Of the Extent, Sowing, and Crops of different Pieces of Land in 1754.

Extent.	Quantity of ſeed in the old way.	Quantity of ſeed in the new way.	Crops.
Acres.	Pounds.	Pounds.	Pounds.
2	336	168	1560
2	356	180	1230
$4\frac{1}{2}$	882	392	2360
$1\frac{1}{2}$	252	130	650
$4\frac{1}{2}$	882	346	2275
$3\frac{1}{2}$	672	283	2080
$9\frac{1}{2}$	2016	670	6110
5	1008	485	4680
1	190	95	1040
$2\frac{1}{2}$	504	230	2520
$4\frac{1}{2}$	819	390	3120
$1\frac{1}{2}$	315	140	975
$2\frac{1}{2}$	694	300	2340
Tot. 44	8926	3809	30940

General Reflections and Obſervations on the EXPERIMENTS *contained in the foregoing Account.*

"After all theſe experiments, I aſk myſelf, whether they are ſufficient to give us a ſatisfactory demonſtration that the New Huſbandry is more profitable than the Old? I anſwer, without heſitation, that it certainly is more profitable, both to the public, and to each individual, whether the lands be cultivated in beds, or whether they are only ſowed in equally diſtant rows, with the drill-plough.

"Such will likewiſe be the anſwer to this queſtion, if the reſult of theſe different experiments be conſidered. In the firſt place, we have thoſe of each field in particular; in the next, we have thoſe of ſome whole farms; and laſtly, we have thoſe contained in the table of the ſixth article, to which laſt I ſhall now limit my reflections.

"We may look upon the produce of forty-four acres ſpread up and down a diſtrict of near thirty ſquare miles, amounting all together to 30940 pounds of wheat, as the medium produce of the generality of lands. I ſhall therefore not dwell upon the produce of each of theſe fields taken ſeparately, but only conſider now, that forty-four acres yielded 30940 pounds of wheat.

"If theſe forty-four acres had been cultivated in the old way, they certainly would not have produced ſo much, ſince we have ſeen that the medium produce is but three times the ſeed; and I am ſatisfied that it would have been leſs in this year 1754. However, I will ſuppoſe the crop to have yielded three times the quantity of the ſeed. Theſe forty-four acres, ſown with 8926 pounds of wheat, would then have produced 26778 pounds; deducting from which 8926 pounds for the ſeed, the neat produce will be reduced to 17852 pounds.

"The forty-four acres ſown with the drill-plough yielded 30940 pounds, from which we are to deduct 3839 pounds, which was all the ſeed that was ſown. The neat produce will then be reduced to 27131 pounds, which is 9279 pounds more than would have been produced in the old way.

"The owners or farmers of theſe forty-four acres had therefore 9279 pounds of corn more. They reaped the firſt benefit of this gain, and the public the next, as ſo much more corn was carried to market than would otherwiſe have been. Such an advantage is very conſiderable, and deſerves the utmoſt attention of the public, whom we invite to conſider it in a more extenſive light. The object will thereby become the more intereſting.

"Let us but conſider how much more corn the whole of this ſpace of thirty ſquare miles would have produced, if all the arable lands in it had been ſown with the drill-plough: how much more grain would it not have afforded for the nouriſhment of the people! what increaſe of income to every individual concerned therein! and how ſure a way to guard againſt future dearths!

"But this is not yet all. Much greater advantages will ſtill reſult from the cultivating of lands entirely in the new way: I mean, by laying them out in beds, and obſerving all the practices of the New Huſbandry. This I proved plainly in my journal of 1753. This demonſtration is fully confirmed by the experiments of 1754, the products of which were greater, and their reſults ſtill more favourable to the new method.

"What has been already ſaid on this important ſubject, ſhews, what the neceſſary operations are, how eaſily they may be performed, and which are the points that merit moſt attention. The theory of the New Huſbandry is now fully proved by experiments; and that great principle, the neceſſity of preparing the earth well by proper ſtirrings, ſo clearly demonſtrated, that it would be needleſs to inſiſt any longer on it.

"But the ſowing of the land, which is of the utmoſt importance to the ſucceſs of the crops, depends greatly on the time and ſeaſon when it is performed, and the care with which it is done. We ſhall therefore give ſome obſervations on that head.

"The three moſt eſſential things which conſtitute a good ſowing, ſeem to me to be, next to the proper preparation of the earth, firſt, the time of ſowing; ſecondly, the

the choice of the feed; and thirdly, the due temperature of the feafon, with refpect to heat or cold, drought or wet; all which greatly influence the ftate of the earth.

"With regard to the time of fowing, I fay, it is better to fow early, than too late, provided the feafon will admit of it. The plants are better able to refift the feverity of the winter, after they have acquired a certain degree of ftrength. There have been years in which fields fown very late, for inftance in December, have done extremely well: but that ought not to be made a general rule; experience fhewing, that fuch late fowings very feldom anfwer.

"By too early fowing, the corn is equally expofed to other dangers. The ftalks which fhoot up before winter cannot well bear hard frofts, which would do no hurt to the wheat when but in blades. I obferved, in the two laft years, 1753 and 1754, that the firft fown wheat, which was attacked by the ruft in autumn, was much more hurt by it than any other. Therefore I think the beft time for fowing, in fuch a climate as Geneva, is, from the 20th of Auguft, to the end of September. If, however, it fhould not be practicable to fow all the lands within that time, the firft fortnight in October may likewife be taken in: but I would not advife this, except in a cafe of neceffity. If all the land fhould not be fown within that time, I think one might expect a better crop by deferring to fow it till fpring. What I have been faying is more particularly applicable to land laid out in beds.

"The fame rules by which I judge of the proper time of fowing here, may eafily be adapted to other climates, in fome of which the land will require being fown earlier, and in others later.

"The choice of the feed is the fecond thing, which to me feems to require more particular care than many may perhaps imagine. Every one certainly endeavours to choofe the beft wheat he can for feed; and it ought likewife to be very clean. Such corn is not difficult to be had, when reaped off the beds cultivated in our way.

"Though wheat fo green that it had fcarce loft its milky quality, fprouted pretty well when I tried the experiment with it; I think it is more proper to fow none but what is thoroughly ripe. The feed has then attained its full perfection; and it is from that ripenefs that we may moft certainly expect the moft vigorous plants.

"The wheat that has been reaped in a warm dry year, feems to me fitter for fowing, than that which has been gathered in a cold wet year: for in fuch a feafon, all the productions of the earth are lefs good; their tafte is lefs favoury; and as that wheat in particular in which there is moft moifture is moft difficult to keep, I infer from thence that the formation of its grain muft be lefs perfect. I fhould therefore prefer wheat a year old, provided the year it was gathered in was warm and dry, to that which may have juft been gathered in too rainy a feafon. Accordingly, I always choofe for fowing, wheat of the growth of my high lands, rather than that which has been produced in flats.

"The benefit accruing from all this care, may, perhaps, not be extremely great; but at the fame time it cofts nothing. Let us do in agriculture what is done in all manufactures: the very fmalleft profits, the very leaft favings, are never neglected. Thofe fmall articles, often repeated, make large fums in the long run, and are a real profit.

"There is another thing of greater confequence, and of which I ftrongly recommend the practice. It will not be attended with any expence. It is, by repeated experiments, always attended with the fame fuccefs, that I have found it to be extremely ferviceable to the firft fprouting of the feed. Chance firft made it known to me.

"I have often fowed, purely to try what wheat was fitteft for fowing. I commonly fowed wheat taken from the heap in the granary. I likewife frequently fowed wheat picked out of the ears the moment before I fowed it. I counted the grains of both forts exactly. Would any one think there could be any difference in the productions of thefe grains? yet I found a confiderable one: what was picked out of the ears always rofe extremely well; fcarce a grain of it ever miffed: whereas numbers of thofe which were taken from the heap, never fprouted at all. I did not perceive this difference at firft; but at laft it ftruck me. I relate the fact as it is, without pretending to account for the caufe of this difference, which would lead me into too long a digreffion. The experiment itfelf may be of real ufe. It fhews us, that inftead of threfhing the wheat intended for feed at any time, without diftinction, it ought not to be threfhed till a very few days, at moft two or three, before it is fowed. A few hands will be able to fupply the feedfmen with as much as they will want. This will not be attended with any fort of expence, and may be the means of faving fomewhat in the feed.

"Perhaps, too, this practice may be attended with a very valuable advantage. I have not, indeed, yet made the trials neceffary to fatisfy myfelf of the reality of what I imagine: but my defire to be of fervice to the public induces me to mention it, that the lovers of agriculture may reflect upon it, and try fuch experiments as will clear up my conjectures.

"Threfhing the feed only juft before it is fowed, may poffibly, in fome meafure, or perhaps entirely, prevent the firft caufe of the diftemper called *fmut*. By this I mean, that the feed which has not been mixed with fmutty wheat, or any infected by its black powder, will be exempt from this diftemper. Not that I take that black powder to be abfolutely the original caufe of this diftemper; but I believe it very capable of communicating it to grains otherwife found.

"I wifh that the multiplicity of my occupations may permit me to endeavour to clear up this matter, and to purfue my obfervations. If I can be fo happy as to make any ufeful difcoveries, I fhall communicate them to the public.

"That nothing may be neglected which can be of any fervice to the feed, great care ought, in my opinion, to be taken in threfhing it, efpecially in the manner which is commonly practifed with flails upon the barn floor, or by trampling it with horfes. In either of thefe ways, a great number of grains are fo bruifed and hurt, that it is impoffible they fhould ever grow. If the wheat intended for feed be not thoroughly dry and hard, the mifchief is ftill greater; much more of it being then abfolutely crufhed by the flail.

"As the New Hufbandry requires much lefs feed, it will be the eafier to execute an operation which might be too long and troublefome to practife for fo great a quantity as is ufed in the old way.

"The method which I advife, and which I myfelf have practifed, is this: let one or two beams, two feet and an half, or three feet thick, be laid acrofs the barn floor: let the threfhers ftand at each fide of the beam, with a loofe fheaf of wheat behind every man, from which he will take a handful at a time, and give it two or three ftrokes againft the beam: this will bring out a great deal of grain, which is to be referved for feed. Thefe ears may be bundled up again, and afterwards threfhed out with the flail for other ufes.

"This method is not fo tedious as fome may imagine: we are fure that not a grain is bruifed; the corns drop very readily out of the ears, efpecially of wheat that has grown in beds: the great fize of the grain helps to open the hufks, and thofe are the moft perfect grains which drop out in this manner. I think I may compare this operation with what is done in the making of wine. The firft running is always the higheft flavoured and beft.

"Though the proper time for fowing be come, the corn ought not to be put into the earth, if the temperature of the feafon is not favourable. It ought, on the contrary, to be deferred in hopes of a change. If the weather is very hot, and the earth extremely dry, there will be an abfolute neceffity of waiting till fome rain has fallen. Without this precaution, the feed will rife but very imperfectly. I am fure of it, by feveral experiments which I have made, and which contradict a common faying of our farmers, that the earth is the beft granary to keep corn. Full of this notion, whenever the ftated time comes round, they fow, without diftinction, in wet or dry land: even heat does not hinder them: they think their feed will certainly fprout well after the firft rain: but I have always experienced that the plants have come up thin.

"I tried an experiment purpofely to fatisfy myfelf, whether one can fow with fuccefs when the weather is very hot, and the earth very dry. Upon reading Mr. Duhamel du Monceau's excellent treatife on the Prefervation of Corn, I obferved, that he had found by his experiments, that wheat which had been dried in a ftove, heated to fixty degrees of M. de Reaumur's thermometer, had loft its faculty of growing.

"From thence I conjectured, that wheat which fhould undergo a heat, for example, of thirty degrees, during a longer time, would be equally parched up, and rendered incapable of vegetating. I confidered the earth, when hot and dry, as a kind of ftove, in which the feed, if it remained too long, without receiving any moifture, may become fo dry, that the greateft part of it will never be able to fprout. I thought this reafoning juft, and therefore determined, in order fully to fatisfy myfelf, to have recourfe to that trufty guide, experience.

"On the eighteenth of July 1754, at four o'clock in the afternoon, I placed M. de Reaumur's thermometer two inches deep in the ground, and fcreened it from the immediate impreffion of the rays of the fun. The liquor rofe to the thirty-firft degree, which fhewed me the heat of the earth.

"The thermometer being afterwards expofed to the fun, the liquor rofe to thirty-fix degrees.

"On the fame day I fowed eighty grains of wheat in this ground. The heat continued nearly the fame during the reft of that month, and almoft all Auguft. On the thirty-firft of July, only ten grains had fhot up, and on the fixteenth of Auguft there were in all fixteen; after which, not one more rofe: confequently fixty-four grains out of the eighty never fprouted at all.

"On the twenty-eighth of July I fowed fifty grains. Only four of them rofe by the fixteenth of Auguft, and not one after. Here were again forty-fix grains which did not grow at all.

"On the fame day I fowed fixty grains in another place. On the fixteenth of Auguft only fix grains had fprouted, and not one plant more ever appeared after: confequently here too were fifty-four grains which never grew. All thefe grains were fown in my garden, in exceeding good mould.

"I was fure that the wheat which I fowed was perfectly found, and in every refpect capable of growing. It was therefore quite clear, that fo great a number of grains out of the whole, which did not fprout at all, had loft the faculty of growing, by their being parched up by the heat and drynefs of the earth. To be ftill more certain of this, three weeks after I had fown thefe grains, I watered half of them feveral times, but to no purpofe; not one of them rofe, and I found feveral of them quite whole in the earth where I fowed them.

"After this experiment, on the eleventh of Auguft I fufpended the fowings which I had begun on the eighth, and did not refume them till the twenty-fixth, after fome rain which fell on the twenty-fecond and twenty-third. Thefe laft fowings rofe much better than the firft.

"Thus it is, that experience and obfervation teach us to leave off bad cuftoms, or fuch as are not founded on principles with which a man of fenfe can reft fatisfied.

"Whenever the produce of the fields on which my experiments were tried, is confidered, it ought always to be remembered, that I ufed no dung on any of thofe lands, and that they received no other improvement than what was owing to a better preparation of the earth, only by ftirring it. Thofe who choofe to have recourfe to dung, will probably reap greater crops: with an hundred loads, they may dung three times more land than is done in the common way; for the dung fhould be fpread very thin, if one would have it be of any fervice. By fpreading it too thick, I believe the plants would grow too rank, and be apt to be lodged.

"The New Hufbandry fupplies the want of dung, not only by ftirring the earth, and not overburdening it with too many plants, but likewife by the ftrong thick ftubble it produces, which affords a moft excellent manure, attended with no expence. It lies ready upon the fpot; the ploughing of the earth buries it; and as it is a long time in rotting, it helps to keep the foil loofe and light, and is repeated every year. I have found ftubble almoft whole at a year's end; and have feen fome not quite confumed at the end of two years.

"But can we be fure that this manure is of any confequence or real advantage? After what I have already feen of its effects, I will venture to fay, that it contributes greatly to increafe the productions of the earth. I have very often plucked up plants remarkable for their beauty, and have frequently found their roots interwoven with tufts of ftubble, which fhewed me the caufe of their extraordinary growth. I fhall foon have more pofitive proofs of this, by the experiments which I am now making to clear up this point."

EXPERIMENTS *made on Beds fown with fix Rows of Wheat: Comparifon of their Produce, with that of Beds fown with only three Rows; and fome Inquiry concerning the Number of Rows which it is beft to fow.*

"In the journal of 1753, Article VII. I gave an account of my fuccefs in fowing beds with two turns of the drill-plough, in order to have fix rows of wheat. It anfwered fo well, that I thought there could be no hazard in fowing a larger extent of ground in the fame manner.

"This experiment fucceeded equally well this year. I fhall not enter into a detail of it, becaufe that would be only a repetition of what I faid on this fubject in 1753. As to the refult, the reader will recollect, that the fame ground made into beds wide enough to be fown with two turns of the drill-plough, which make fix rows, produced more corn than if it had been fown in beds with only one bout of the drill-plough, which would have made but three rows.

"With regard to the quantity of the products of the crops of 1753 and 1754, compared together, I have found that the fix rowed beds produced this year very nearly the fame as they did in 1753; excepting the field of the experiment, No. VIII. which yielded about half as much again as the year before.

"Notwithftanding the profit which I found in thefe experiments, repeated two years running, I do not think it advifable to enlarge the number of rows to fo many as fix. Five will, in my opinion, be very fufficient; and they may be made with one bout of the drill-plough, by giving it five fhares, which is very eafily done. This number of rows will be a proper medium between fix and three.

"Sowing in five rows will not, however, do in all forts of land. I believe it fhould be practifed in none but good foils, and that middling lands fhould continue to be fown with three rows at moft.

"I fhould add farther, with refpect to good lands, that they ought not to be fown with five rows, till after they have been thoroughly well ftirred; and, above all, not till after the main furrow in the middle of the bed has been cut extremely deep, in order that the roots of the middle row, which is the moft diftant from the ploughed alleys, may find a fufficient depth of mould immediately under them, to fupply them with their neceffary nourifhment.

"But at the fame time that a provifion is made for the nourifhment of the plants, care muft be taken not to lofe too much ground, by making the alleys wider than they need be. My experiments have determined me to make my beds, for the future, about fix feet wide. By leaving feven inches diftance between each row, the five rows will take up about two feet four inches, and there will remain three feet eight inches for the breadth of the alleys. This fpace is fufficient for the plough or cultivator to work in with eafe."

EXPERIMENT *made in order to know which is the moft profitable Way of fowing the Beds, and to afcertain more precifely the Quantity of Seed proper to be ufed, in order to have the greateft Crop.*

"The above title divides it naturally into two parts, which I fhall treat feparately.

"It is of great confequence to know which is the moft profitable way of fowing the beds; I mean, that by which they will be ftocked with a proper number of plants: for when too much feed is fown, the plants hurt one another;

ther; and when too little, the earth is not enabled to produce ſo much as it is capable of doing.

" The buſineſs therefore is, to determine what number of plants would be moſt advantageous. Fortunately, the difference is wide enough between the too great, and the too ſmall number; and the produce of the crops cannot be diminiſhed but by an exceſs one way or the other.

" But whatever certainty we may acquire with reſpect to this intereſting point, we cannot flatter ourſelves that we ſhall always be able to keep to it in our practice. The various accidents to which corn is liable, from the hour of its being ſown till it is reaped, will always fruſtrate the methodical arrangement which we may have intended to give the plants.

" The difficulty of ſucceeding in this inquiry ought not however to diſcourage us; for it would be attended with ſuch advantages, as would make very ample amends for all the labour beſtowed upon it. Let us then have recourſe to experiments. Thoſe that are made with this view, will never be quite uſeleſs. If they do not lead us to the very thing we are in ſearch of, they may at leaſt diſcover to us others which may be of ſervice.

" According to our principles, the diſtances between plants ought to be equal throughout the whole length of the rows, that all of them may have an equal quantity of earth from which to draw their nouriſhment.

" Several experiments have ſhewn, that ſix inches is not too great a diſtance for the plants to be at from each other. In this caſe, it would be ſufficient to ſow one grain of wheat at every ſixth inch. According to this diſpoſition, a field well prepared ought to produce the greateſt crop. The plants will very commonly branch out ſo as to have twenty, thirty, or forty ſtalks: I have had ſome with upwards of eighty. It is pity that this exact diſtribution of the ſeed cannot ſubſiſt long. The accidents which I met with, ſoon convinced me, that it was neceſſary to increaſe the quantity of the ſeed, and that very conſiderably.

" However, this does not yet hinder me from thinking, that if any eaſy method could be found, to have a plant of wheat exactly at every ſix inches diſtance in rows, it would be the beſt way of ſowing. I have often conſidered how this could be reduced to practice, as well to ſatisfy my curioſity, as that I might be the better able to proceed in my operations. When a theory is known to be good, one is ſtrongly encouraged to draw all poſſible advantages from it for the practical part: one then proceeds with confidence and pleaſure.

" Experience having convinced me that it never would be poſſible to have a plant at every ſix inches in each row, by ſowing only a ſingle grain of wheat at thoſe diſtances; it naturally followed, that the way to have the ground better covered with plants was, to ſow more grains. The next queſtion was, how many grains ſhould be ſown in each place: ſhould it be two, three, or more? Experience only could clear this doubt. I therefore tried the following experiment. I ſowed a different number of grains in cluſters, ſix inches diſtant from each other, putting one grain in the firſt, two in the ſecond, and ſo on to the ſixth, which had ſix grains: then I began again, and went on as before, till the whole length of the row was ſowed in this manner. The produce of each cluſter was to ſhew me whether it would be beſt to double, triple, or quadruple the ſeed, which it was plain had been ſown too thin, when only a ſingle grain was dropt at every ſix inches.

" The winter of 1753 was already far advanced when theſe thoughts firſt occurred to me. It was then too late to try this experiment with wheat: but, that I might not loſe a year, I did it in the ſpring with barley, not doubting but that corn, which is uſually ſowed in March, might furniſh me with ſome uſeful hints for the culture of that which remains longer in the ground.

" Accordingly, on the ninth of April, 1754, I ordered another bed to be ſowed with barley, in my preſence, and in the manner I have juſt related. I counted all the grains of each cluſter myſelf. They were ſown in three rows. I varied the experiment in the row next to the ſouth, by ſowing no cluſters there of leſs than three, four, five, or ſix grains; and this I continued during the whole length of that row. At harveſt, all the cluſters in which ſeveral grains had been ſown, were ſo thick, that they touched one another.

" What is of moſt conſequence to our culture, is, to know the produce of each cluſter. I ſhall only add, that the cluſters, as they are here ranged under their reſpective numbers, occupied forty feet in length, and that the beds were five feet wide.

RESULTS.

" The ſouth row,
ſowed with 6, 5, 4, and 3 grains,
produced 661, 624, 447, and 493 ſtalks.
In all 2225 ſtalks.

" The middle row,
ſowed with 1, 2, 3, 4, 5, and 6 grains,
produced 48, 72, 147, 204, 219, and 487 ſtalks.
In all 1177 ſtalks.

" The north row,
ſowed with 6, 5, 4, 3, 2, and 1 grains,
produced 502, 372, 345, 276, 200, and 92 ſtalks,
In all 1787 ſtalks.

" Conſequently the whole number of ſtalks in the three rows was 5189. They yielded ſeventeen pounds of grain, beſides a great quantity that was ſhed in reaping.

" On the footing of this crop, an acre would contain at leaſt forty-four beds five feet wide, which was the breadth of the bed on which this experiment was made. The beds would be 222 feet long: the produce of one of them would be ninety-three pounds eight ounces, and that of the 44, 4138 pounds eight ounces; that is to ſay, near nine quarters to the acre: a very conſiderable crop; and which might be carried ſtill much farther by other experiments of this kind, as we ſhall ſoon ſee.

REMARKS.

" The following obſervations deſerve the reader's utmoſt attention. Firſt, By this experiment, I have very near effected what I aimed at, viz. to have two or more plants grow ſo cloſe together as to ſeem but one; and that at ſix inches diſtant from each other. If the three rows had been joined together lengthways, they would have been 120 feet long, and ought to have contained but 240 plants: but the diſtances, which were marked by gueſs, not being exactly ſix inches each, ninety-ſix cluſters were ſown in each row, which made ſixteen cluſters over and above. By this means, ſeveral of them were nearer than ſix inches to each other.

" Two hundred and eighty-eight cluſters were ſown, all of which produced plants, except twenty-five which did not ſprout, or of which the plants periſhed. This deficiency is not very conſiderable: but we muſt obſerve, 1. That almoſt all the places where this happened had been ſown with only one or two grains of wheat: 2. That it was in the middle row that the greateſt number of plants was wanting: 3. That the ſouth row, in which the ſmalleſt quantity ſown for any one tuft was three grains, furniſhed and retained its full number of plants: and laſtly, that almoſt all thoſe which were next to the vacant ſpaces, were ſtronger than the reſt, and thereby made amends for the loſs of the others.

" Secondly, The whole number of the ſtalks amounted to 5189, which is after the rate of forty-three ſtalks and a quarter to a foot: but it is much more conſiderable in the ſouth row, which having produced in all 2225 ſtalks, the proportion is fifty-five and a half to a foot. The cauſe of this difference is eaſily ſeen. The expoſition of that row to the ſouth, being more favourable than that of the others, may have contributed thereto; but it is very plain that it was chiefly owing to this farther circumſtance, that none of the cluſters in that row were ſown with ſo few as one or two grains.

" Thirdly, We ſee that the increaſe of the ſtalks was, in general, in proportion to that of the ſeed; only the cluſters which were ſown with three grains in the ſouth row, produced forty-ſix ſtalks more than thoſe which were ſown with four grains; but ſtill the general refult of the three rows remains exactly in the fame progreffion, as appears by the following

"RECAPITULATION.

Stalks produced by 1 grain	— —	140
— — — —	2 gr.	— —	272
— — — —	3 gr.	— —	916
— — — —	4 gr.	— —	996
— — — —	5 gr.	— —	1215
— — — —	6 gr.	— —	1650
		Total	5189

" Fourthly, The ears were nearly equal, at leaft in two thirds of the length of the rows: the other third furpaffed the reft, as will appear by the following extract of the twelve firft numbers of the fouth row.

Numb. 1	— produced —	87	ftalks.
2	— — — —	122	
3	— — — —	91	
4	— — — —	99	
5	— — — —	82	
6	— — — —	66	
7	— — — —	78	
8	— — — —	100	
9	— — — —	87	
10	— — — —	116	
11	— — — —	148	
12	— — — —	68	

" Fifthly, The difference between the produce of the clufters fown with one and with fix grains, is extremely great. The former produced but 140 ftalks; the others multiplied to 1650. It is true that the number of the clufters of fix grains is greateft; which is fome diminution of the difference.

" Sixthly, I obferved feveral ftalks from which others had fhot out, all as ftrong, and as long, as thofe from which they derived their origin. They proceeded from the firft joint above the furface of the earth, generally at the heighth of three, four, or five inches; and were two, three, and fometimes four in number. I never perceived this kind of tillering before; but had, till then, always obferved it to be at the neck, or point of feparation between the roots which defcend, and the ftalks which afcend, that the plants branched out.

" Seventhly, I fufpected, in the fummer, what was the caufe of the great vigour of the plants of this experiment: but I faw it much plainer after harveft: for, upon pulling up fome of the tufts of ftubble, I found their roots innumerable. This fact is ftrictly true. I could not count them upon any one plant that had more than fifteen or twenty ftalks. Thefe roots were in fuch bundles, and fo confufedly interwoven one with another, that, after counting feveral hundreds of them, I was forced to give up the talk. Their length and thicknefs was anfwerable to their number.

" I muft now remind the reader of what I faid before, that the feveral accidents which I met with in my firft experiments fhewed me it was neceffary to increafe the quantity of the feed. I did fo, by fmall degrees, from year to year. It was equally important for the fuccefs of the new culture, not to run into another extreme by loading the earth with more plants than it can nourifh: the crop would be confiderably diminifhed thereby.

" It appears by this experiment, that the clufters which were fown with fix grains did not hurt one another: on the contrary, their being fown in that manner proved an advantage, fince they produced much more than the others: from whence it follows, that one may, without danger, extend the quantity of the feed beyond the limits of the principles of the New Hufbandry. The principles themfelves are not the lefs true; though the farmer is at liberty to ufe his own difcretion in the application of them, according to the nature of his foil.

" Thofe principles, which fuppofe that every plant is to fubfift till harveft, reduce the feed to a very fmall quantity: but numbers of accidents deftroy many of them. Our reafon ought confequently to tell us, that, without deviating too much from the principles which we adopt, we may, and fhould, judicioufly ftock our land with a fufficient number of plants, in order to guard againft unavoidable accidents.

" Still I may be afked, what is that fufficient quantity? I anfwer, that our experiment fhews that fowing fix grains together in a clufter, from fix to fix inches, all the length of the rows, will not be found too thick. By following this rule, one may be almoft certain that the whole ground will be ftocked with a proper number of plants. However, this is to be looked upon only as a general propofition, from which it will often be very proper to deviate in the circumftances we are going to mention:

" When the fowing feafon is favourable.
" When the land is well prepared.
" In countries where the winter feldom is fevere.
" When the land is but little liable to infects.
" When the land is not in danger of being hurt by too much drought, or too much wet. And laftly,
" When the land is good and very fertile.

" In all thefe, and other fuch like cafes, lefs feed fhould be fown; and, in the contrary cafes, more. Prudence, and a careful ftudy of the nature of the foil, ought to be our guides. Two or three years experience will be fufficient to fhew us the practice which will anfwer beft.

" It will be right to repeat our laft mentioned experiment, and even to vary it. In all probability it will afford us ftill greater lights. It will be right, for example, to fow the clufters with a greater number of grains, beginning with fix, the produce of which is known, and going on to feven, eight, and even more, always in clufters, till one comes to a number at which the crop ceafes to yield an equal profit. By this means the two extremes, either of too much or too little feed may be known; and the juft proportion will then eafily be determined.

" Some farther alterations may likewife be made in this experiment. For example, I placed the grains in the earth fo that they touched one another. I will try to place them at fome little diftance from each other, and to range them in a kind of circle, of about three inches diameter. It is reafonable to think, that the plants may make a greater progrefs then, as they will not have all one common centre: fome of them will be nearer to the ploughed alley; their roots will reach it more eafily than before; and will multiply there, which may render the plants more vigorous.

General Difpofition for the farther Progrefs of the New Hufbandry, and particularly for the Crop of 1755.

" It is with uncommmon fatisfaction that we fee the trials of the New Hufbandry multiply daily. A great number of intelligent perfons have fown part of their lands in equally diftant rows, with the drill-plough, for the next harveft. We have already feveral farms, and among them fome confiderable ones, in the neighbourhood of Geneva, which are no longer fown any other way.

" It is much to fee this new method thus readily entered into. Thofe who follow it, will foon begin to take a pleafure in calculating, and will be curious to compare the new crops with the old. Thefe calculations will infenfibly lead to others, on the produce of lands laid out in beds. They will fee, that there can be no hazard in making a few trials. Thus it is, that feveral have been determined to cultivate fome of their lands this year in beds.

" That thefe arguments fhould have their full weight with men capable of reafoning, is not to be wondered at: but I confefs I have been agreeably furprifed, to find this conviction extend to people who can feldom be prevailed upon to leave their beaten track. Some peafants in thefe parts fent a meffenger this winter to tell me, that they began to have a good opinion of my method; that they were aftonifhed at the beauty of my young plants, the like to which they had never feen before; and that, if they continued to do well, and met with no accident, I ought to have a prodigious crop. After this preamble, he continued, faying, that he was directed to beg of me to him the particulars of my experiments; for that feveral of his neighbours had agreed to meet, in order to read them over in the winter, and to make their little reflections upon them. He concluded with adding; "I believe we fhall all agree to fow in equally diftant rows with the drill-plough; and perhaps too we may, by and by, lay our lands out in beds."

"This conduct of the peafants feemed to me fenfible and prudent. I gave them the experiments of 1753, and fent them word, that both my advice and my drill plough were at their fervice; and that it fhould not coft them any thing, if they chofe to make a trial of it. They have been well fatisfied with what they have read, and feem difpofed to accept of my offers.

"I have experienced this year, more than ever, the facility with which lands are cultivated in the new way. No part of the farm where I fome time make a little ftay, is any longer cultivated after the old method. The moft troublefome part is now over: my lands were fown in a favourable feafon; the plants rofe extremely well, and flourifhed perfectly till the beginning of winter; but the feverity of the frofts has proved fatal to many parts of my fields, and will certainly be a detriment to my crops."

Continuation of M. De Chateuvieux's *Experiments in the Years* 1755 *and* 1756.

"My lands were cultivated in 1755, in the fame manner as in the preceding years; I therefore fhall not enter into any detail upon that fubject. When I fowed my fields, they were well prepared to receive the feed; the fpring was pretty kindly; and towards the end of autumn my corn was very fine, excepting fome fpots that were attacked with the ruft fo early as the tenth of November: other places, in which the plants were ftrong and healthy, promifed a moft plentiful crop; and though it was greatly diminifhed by the winter's froft, it proved, upon the whole, fufficient to confirm the advantages of the New Hufbandry, which have been already proved in my former accounts.

"The winter of the year 1754, was extremely fevere. The froft, which was exceffively intenfe, lafted a long time, and killed a prodigious number of plants: thofe that refifted it loft fome of the branches they had fhot out in the autumn before, and the plants fo weakened branched but little in the fpring. The evil would have been infinitely greater, if the ground had chanced to be full of water, when thofe exceeding hard frofts came on; but luckily it was not very wet.

This winter was followed by a very dry fpring, uncommonly hot, and confequently unfit to recover the corn. The fummer, in which there was fcarce any rain or dew, but very frequently fultry fcorching heats, exhaufted the plants in feveral fields. I was not furprifed at it. The feafons were extremely unfavourable to the productions of the earth; and, to add to the misfortune, a vaft quantity of worms did likewife confiderable damage to the corn.

"However, my wheat rofe; the ftraw was pretty near as long as in the preceding years, and the ears were well filled with grain. The ploughings had been well performed, which kept the earth in a ftate of moifture; lefs indeed than in 1754, becaufe but very little dew fell in 1755.

"The wheat cultivated in the old way yielded but few fheaves: the ftraw was fhort; the ears were very full of grain; and, in general, the quality of the corn was excellent.

"There was room to expect good fuccefs from the lands that were fown in 1755, for the crop of 1756. The young plants rofe extremely well, the ground had been properly prepared, and had the degree of moifture neceffary to promote their growth.

"Though fome flight frofts were felt towards the latter end of October, they did not prevent the growth of the corn, the cold abating from the twelfth of November, to the end of that month. M. de Reaumur's thermometer was, during that time, at from fix to eight degrees above the freezing point. At the fame time we had pretty frequent, and often plentiful fhowers of rain.

"The corn was in very good condition at the beginning of the winter, during which there was fcarce any froft, excepting the ten firft days of December, when the thermometer fell to about fix degrees below the freezing point. During the months of January and February, it was pretty conftantly above the freezing point: we had little fnow, but pretty frequent rains.

"The fpring and fummer of 1756 having been extremely rainy, and the earth too much foaked thereby, the plants were poor, and the fummer ploughings could not be performed. For this reafon, I could give feveral of my fields but one ftirring, and others had two. I would not plough whilft the earth was fo very wet: for that would only have hardened, and, as it were, kneaded it; and I judged that fuch bad ploughings would have been equally prejudicial to the corn then growing, and to the preparation of the fallow for the next fowing. I found afterwards, that I had done right.

"It could not be but expected, that fo unfavourable a feafon would prove fatal to the corn. I had obferved during all the month of April, in which there was not any froft, and the thermometer was from five to feven degrees above the freezing point, and towards the end of that month from nine to twelve degrees, that the corn made but little progrefs, and grew yellow. The diftemper continuing to increafe, I perceived in May, that the corn was attacked with what we call the rickets. The bad ftate of the roots of thefe plants, the colour of their blades turned to a blueifh green, and yellow at the point, left no room to doubt what ailed them; and from that time it was eafy to forefee that the crop would certainly be fcanty, not only on account of the fmallnefs of the number of ftalks which the plants had produced, but alfo becaufe their ears would have but little grain.

"In June the healthy plants throve greatly: the ftraw grew long; but yet the fheaves did not yield fo much grain as in the foregoing years by about a fifth part, as nearly as I could judge. The corn was very fine and very clean; and had it not been for this accident, I am confident that the crop would have been very plentiful.

"I did not fee any one field exempt from this diftemper. Exceeding fine corn, cultivated in the old way, was totally infected with it; and the fheaves in general yielded but about half the quantity of grain that they ufually do in good years. Thefe grains were very fmall, and mixed with a great many feeds of weeds.

"Thefe general notions are neceffary, in order to form a right judgment of the refult of my experiment, which I fhall relate in the following order.

"The firft article will comprehend the experiments which I made upon all the fields I laid out in beds, the laft of which now bore their third crop. I have diftinguifhed them by the fame numbers as in the former years, and fhall add to each of them the particular obfervations which relate immediately to it.

"The fecond article will fhew the produce of the lands fown in equally diftant rows with the drill-plough. I fhall make fome reflections upon the ufefulnefs of this practice, which is certainly alway preferable to the common way of fowing.

Experiments *made on Fields laid out in Beds, the laft made of which have borne three fucceffive Crops. Thefe Fields are diftinguifhed by the fame Numbers as in the foregoing Years. Obfervations relating particularly to each Experiment.*

Experiment, Numb. I.

Year 1755.

N. B. This was made on the fame piece of ground as my firft experiment in 1751: and this year's crop was the fixth, without any interruption.

"I gave a very full account, in the ninth article of the year 1754, of the experiment I made in order to be the better able to judge which is the moft profitable way of fowing the beds, and to determine what quality of feed is moft proper to fow, in order to have the greateft crop; and this I called, fowing in clufters, at the diftance of fix inches from the centre of the one to that of the other. I fhall only remind the reader here, that the fpot of ground which was fowed in clufters with barley in the fpring, was part of a bed,

bed, forty feet long, and that the produce of the grain was feventeen pounds weight, befides a confiderable quantity which was fhed in reaping.

" This experiment, which deferved to be repeated, was tried again the fame year, and upon the fame ground which I had fowed with barley. This laft grain being reaped, I fowed the fame bed with wheat on the twenty-third of September following: but it is to be obferved, that I did not plough this fpot after the barley was off, but only plucked up the ftubble, and made three channels, into which the feed was dropped by hand in clufters fix inches afunder.

" As the clufters fown with fix grains, in the experiment of 1754, were thofe which produced the moft ftalks and grains, I fowed all the clufters now with at leaft fix grains, fome with feven, and others with eight, keeping all the grains at fome little diftance from each other. The bed forty feet long contained eighty-three clufters in each row, which were fown with two ounces fix penny-weights of wheat.

" The plants came up very well: I fpared no pains to cultivate them; they throve wonderfully till harveft; their blades, ftalks, ears, and grains, were very fine; and I preferved them from the birds with a net; but as I would not reap them till they were thoroughly ripe, a great deal was fhed in cutting them down, and they yielded me but twenty-eight pounds of corn.

OBSERVATIONS.

" This experiment is a farther confirmation of the refult of the firft which was made in 1754, viz. that fix grains are not too great a number to be fown in a clufter, fix inches diftant from the next clufter. I had not leifure to count the ftalks which each clufter produced; but the twenty-eight pounds of corn which they yielded, feemed to be a fufficient proof.

" The circumftance of not ploughing the bed before it was fowed, confirms the advantages of preparing land according to the New Hufbandry.

" I faid, that the ftubble was plucked up, in order to prepare the bed for being fown. This fhewed me how much ftubble helps to enrich land.

" When this bed was fowed, and the corn fprung up, I ordered the furrows which were made before winter, next to the outward rows, to be opened for about half the length of the bed, and the ftubble to be put into them, and covered over with earth: confequently it was laid in the ground which was cultivated, and in that part of it where the plants were to extend their roots. As the quantity of roots collected there was pretty great, I concluded that the effect of the ftubble ought to be much more vifible in that place, than it can be in fields where the ploughman buries it as chance directs. In effect, that part of the bed became much finer than the reft; the plants produced a greater number of ftalks; and there is no room to doubt, that the ftubble was an excellent manure.

Year 1756. Numb. I.

" I propofed to continue fowing this bed in clufters, and to increafe the quantity of the feed, in order to fee what the effect would be: but, in hopes of better fuccefs, I gave up the thoughts I once had of reaping a third crop from this bed without ploughing it.

" After one ploughing, I fowed it on the fixteenth of September, 1755, in three rows of ninety-three clufters in each row, and ten or fifteen grains in each clufter; and, in order to place them with fome kind of regularity, I made ufe of an iron hoop, about three inches in diameter, which was laid upon the ground at each fpot intended to be fowed, and the grains were dropt at nearly equal diftances, fome round the infide, and fome in the middle of this circle. Each clufter was fowed in this manner. The fpace from one center to another, was about five inches. The feed was covered over lightly with a rake, and the quantity employed in this operation was five ounces twelve penny-weights.

" This wheat was always very fine from its firft rifing till harveft. It was reaped on the thirty-firft of July, and yielded twenty-three pounds of grain.

OBSERVATIONS.

" Though the produce of this bed was lefs now than in 1755, I did not think this difference ought to be imputed to the increafe of the quantity of feed fown; becaufe the plants were as ftrong as could be wifhed for, their ftraw was as long as in the former years, and their ears were as large: but I obferved, that this bed had not been quite free from ficknefs, and that it contained a pretty confiderable number of rickety plants, which yielded but little grain.

" It refults from this experiment, that a certain quantity of feed is neceffary, to counterbalance the many accidents to which corn is perpetually liable.

" Though this bed might have yielded a greater quantity of grain in a more kindly year, yet its produce, even in this, was very confiderable: for if we reckon in proportion the produce of an acre, it would yield 3795 pounds (nearly eight quarters) of grain, produced by fifty-fix pounds ten ounces of feed: which is after the rate of fixty-feven for one.

" To this it will be objected, that though a fmall fpot of ground, like that we have been fpeaking of, was made to produce fo confiderable a quantity of corn, it would probably not be poffible to obtain fuch a crop in proportion from an extent of fome acres of land. It may be fo: but fuppofing the crop to be even greatly inferior, it would ftill be much more confiderable than the common crops.

" Let us examine this queftion more minutely. It is of great confequence not to embrace an opinion, and efpecially a difadvantageous one, before it has been carefully confidered. Let us fee then to what the diminution of the crop may be owing. I fay nothing of the particular accidents which may in general leffen crops: but fuppofing all things equal, in fuch an extent of ground, my opinion is, that the firft and effential caufe of the mifcarriage can be imputed only to the cultivator himfelf, who fees what is beft to be done, but neglects it; and who ought at leaft to endeavour, as much as he poffibly can, to do that in great, which he fees fucceed fo well in fmall.

" I grant that many reflections and reafonings, which feem at firft fight to be extremely appofite, are in reality oftentimes only fpecious and deceitful, and that it is always right to recur to experimental proofs. Luckily we have fuch ready to produce.

" The celebrated Wolfius obferved long ago, that the productions of plants which grow in large pieces of ground, are always fine when the feed has been properly buried, and fowed thin: whence he concluded, that the moft extenfive fields ought to produce as much in proportion as fmall ones, and that it is evident that whenever an experiment has been made with the neceffary precautions, and has fucceeded upon the tenth part of any piece of ground, it ought to fucceed equally upon two, three, or four tenths, and confequently upon the whole of that ground.

" The experience of five years, of which I fhall give an account in the following article, will, I believe, prove this very fufficiently."

EXPERIMENT, Numb. II.

N. B. This field is marked with the fame number in the former experiments.

For the crop of 1752, it was fowed with eleven pounds four ounces of wheat, which produced 1041 pounds twelve ounces.

For the crop of 1753, it was fowed with thirty-four pounds fourteen ounces, which produced 1575 pounds.

For the crop of 1754, it was fowed with fixty-one pounds fourteen ounces, which produced 1820 pounds.

For the crop of 1755, it was fowed with feventy-eight pounds, which produced 1950 pounds.

For the crop of 1756, it was fowed with fifty-one pounds, which produced 1885 pounds.

Year 1755.

" I had now cultivated Smyrna wheat for fome years, fowing the whole of each year's produce, in order to increafe my quantity fo as to be able to fow a pretty large field with it; which I could not complete till 1754, for the crop of 1755.

" The

" The field in queſtion was ſowed with ſeventy-eight pounds of this corn. It roſe very well: but towards the end of winter, I was ſurpriſed to find that a great quantity of plants had been deſtroyed by the froſt; and I ſoon perceived, that almoſt all the ſtrongeſt and healthieſt plants were thoſe of common wheat, and that there were very few of Smyrna wheat. I had obſerved at the time of ſowing, that there was ſome mixture in the ſeed: and as I had ſome of the ſame ſort ſtill remaining, I was able to ſatisfy myſelf that there was a third part of common wheat in the Smyrna wheat which I had ſown; and that it was the former which grew ſo fine, and of which almoſt the whole crop conſiſted.

" This ſhews that Smyrna wheat does not reſiſt hard froſts: but at the ſame time, ſuch winters as that of 1754, very ſeldom happen in this country. This field was reaped on the 19th of July; the common wheat was thorough ripe, and the Smyrna wheat quite green, though its grain was grown very hard.

" I ſeparated the ears of Smyrna wheat from the others, in order to bind them up in diſtinct ſheaves, that I might have their grain pure and unmixed. This field produced 213 pounds of Smyrna wheat, and 1737 pounds of common wheat; in all 1950 pounds; which is a greater crop than that of the preceding years."

Obſervations on Smyrna Wheat.

" My former crops of this wheat, though the quantity was but ſmall, had already ſhewed me plainly that it produces more grain than any other kind. In 1755, the ſheaves of this wheat, of the ſame ſize as thoſe of our common wheat, yielded more grain by half than the others did. It is therefore probable, that the planting of this grain will be attended with advantage, eſpecially in climates not ſubject to too hard froſts.

" But a point of very great importance, is, to know well at what degree of maturity this corn ſhould be reaped. In the two firſt years that I ſowed any of it, the ears were prodigiouſly large, and full of very plump well fed grain; but I was uneaſy at not ſeeing them ripen. They continued green, whilſt I daily expected that they would turn yellow, and the grains grow hard, but in vain. By this delay, the grain waſted ſo much, that I never ſaw any ſmaller, nor ſo much ſhrunk as theſe. However, they ſprouted well when ſowed, and produced very fine plants.

" The third year, I determined to reap them earlier than I had done the firſt. Accordingly, I cut them down as ſoon as I found that the grain had acquired a ſufficient degree of hardneſs, notwithſtanding that the corn was ſtill quite green. The conſequence of this was, that the grain remained exceeding plump and fine."

Year 1756.

" I continued to ſow the ſame field with Smyrna wheat, of which I procured ſome quite pure and unmixed. I ſowed fifty-one pounds of this wheat on the firſt of October. The plants were fine, and ſufficiently forward before winter, and throve prodigiouſly from ſpring till harveſt. But I ought not to omit obſerving, that Smyrna wheat is as apt to be rickety as common wheat, and that numbers of theſe plants were affected with that diſtemper.

" This crop was reaped on the twenty-ninth of July, whilſt it was yet green, and the grain only hardened. It yielded 1885 pounds of exceeding fine, clean, good ſized wheat."

OBSERVATIONS.

" It would be needleſs to make experiments, if the inſtructions which they may afford were not to be attended to: but as thoſe inſtructions will ſometimes eſcape the notice even of the moſt careful obſerver, it is proper always to repeat the experiments, and to continue them conſtantly for ſome time. It is by ſo doing, that the advantages of the New Huſbandry will appear in their true light, and be eſtabliſhed beyond diſpute.

" The field I am now ſpeaking of, and from which I reaped five crops in five ſucceſſive years, preſents us real and very conſiderable advantages, which I ſhall ſet forth in what appears to me the juſteſt and moſt ſtriking manner.

" To this end, I ſhall ſtate exactly the products of the field in queſtion, cultivated in the old and in the new way. I ſhall begin with its produce during ſixteen years that it was cultivated according to the rules of the Old Huſbandry: namely, from the crop of 1730, to that of 1744 incluſively. In this ſpace of time, it produced eight crops; the cuſtom of the country being to ſow but once in two years, and to reſt the ground each alternate year. My account may be depended upon, as perfectly exact. I have extracted it out of a journal kept by a ſteward of mine, who died in 1745, and who was ſcrupulouſly exact even in the ſmalleſt concerns.

" After giving the produce of this field, the ſoil of which is very good and ſtrong, during ſixteen years that it was cultivated in the old way; I ſhall ſhew what the ſame field produced in five years cultivation according to the new method, in order to compare the different products of only five years with thoſe of ſixteen; and afterwards draw a compariſon between both the cultures for ſixteen years, ſuppoſing, which is a great diſadvantage, that the eleven remaining years of the New Huſbandry produced no more than theſe firſt five have done."

Number I.

" *Produce of the Field, Number II. during ſixteen Years that it was cultivated in the old Way; viz. from the Crop of the Year 1730, to that of the Year 1744, incluſively.*

SOWED.

		Pounds.	Pounds.
In 1729	- - - - - - - - - - - - - -		267
1731.	Wheat - - - - - - - -	425	488
	Barbary wheat - - - -	63	
1733.	Wheat - - - - - - - - - - -		441
1735.	Wheat - - - - - - - - - - -		504
1737.	Engliſh wheat - - - - - - -		441
1739.	Wheat - - - - - - - - - - -		441
1741.	Wheat - - - - - - - - - - -		472
1743.	Wheat mixed with tares - - - -		504
	Total ſeed of eight years - - -		3558

REAPED.

		Pounds.
In 1730.	- - - - - - - - - - - - -	1134
1732.	A year extremely bad, on account of the great quantity of ſlugs which deſtroyed the wheat, and the many ſeeds of weeds intermixed with it.	1606
1734.	- - - - - - - - - - - - - -	1953
1736.	- - - - - - - - - - - - - -	1008
1738.	- - - - - - - - - - - - - -	977
1740.	- - - - - - - - - - - - - -	1291
1742.	- - - - - - - - - - - - - -	1638
1744.	- - - - - - - - - - - - - -	1512
	" Total amount of the crop of eight years, in the ſpace of ſixteen years - - -	11119

To be deducted.

	Pounds.	
Siftings of 1732 - - - - -	756	
* Siftings of the other years - -	1009	
Seed, as above - - - - - - -	3558	
		5323

" Remains for the neat produce of ſixteen years, 5796

* " This field always produced clean corn, greater pains being taken to keep it free from weeds, than could be beſtowed upon other pieces of ground, more diſtant or more extenſive. The ſiftings would otherwiſe have been more conſiderable in ſo many years.

Number II.

" *Produce of the Field, Number* II. *during Five Years of Culture in the new Way.*

S O W E D.

		lb.	oz.
In 1751.	Wheat - - - - - - - - -	11	4
1752.	Wheat - - - - - - - - -	34	14
1753.	Wheat - - - - - - - - -	61	14
1754.	Smyrna wheat - - - - - -	78	
1755.	Smyrna wheat - - - - - -	51	
	" Total feed of five years - - - -	237	0

R E A P E D.

	lb.	oz.
In 1752. - - - - - - - - - - - -	1041	12
1753. - - - - - - - - - - - -	1575	
1754. - - - - - - - - - - - -	1820	
1755. - - - - - - - - - - - -	1950	
1756. - - - - - - - - - - - -	1885	
" Total amount of the crops of five years,	8271	12
" To be deducted for the feed, as above,	237	
There was no fifting.		
" Remains for the neat produce of the five years - - - - - - - - - -	8034	12

Number III.

" *Comparifon of the above Produce of the new Culture with that of the Old.*

	lb.	oz.
" The NewHufbandryproduced in five years, without any intermediate year of reft,	8034	12
" The Old Hufbandry produced in 16 years,	5796	
" Confequently the NewHufbandry produced in five years, more than the Old did in fixteen, - - - - - - - - -	2238	12

Number IV.

" *Farther Comparifon of the Produce of the New Hufbandry with that of the Old, as above.*

N E W H U S B A N D R Y.

	lb.	oz.
" The New Hufbandry produced in five years,	8034	12
" Suppofing the crops to be to the fame for 11 years more, they would amount to	17676	7
" And for 16 years, to - - - - - - - -	25711	3

O L D H U S B A N D R Y.

	lb.	oz.
" The neat produce of the Old Hufbandry, in 16 years, was - - - - - -	5796	
" The balance in favour of the NewHufbandry would confequently be, in 16 years	19915	3

Reflections and Obfervations.

" I dare to fay that very few of thofe who might juft have glanced over the products of the five years during which the field Numb. II. was cultivated in the new way, would have imagined the advantage to be near fo great as it really is, had not the above comparifons been likewife laid before them. If nothing but the hope of great profit can recommend the New Hufbandry to the general practice of our farmers, the above calculations ought at once to determine them; fince they here fee that the fame field produced much more grain in five years, and even in four, when managed in the new way, than it produced before in fixteen years, whilft cultivated according to the old method. I confefs that when I firft began to practife the New Hufbandry, I did not expect fo great advantages. They might have been greater ftill, if I had not committed in the firft years, faults which confiderably diminifhed the crops of 1752 and 1753. Befides thofe firft faults, I committed another, which greatly leffened my crops. I was not aware that the fertility of every field which is ploughed deeper than it has ufually been, is often leffened for fome years, unlefs it be affifted by a fufficient quantity of manure. The new earth which is brought up to the furface by thefe ploughings, remains fo hard and compact, that it cannot be fit for the nourifhment of plants, till after it has been well broken by repeated ploughings, and as it were ripened by the influence of the air, &c.

" This obfervation will be particularly ufeful to all beginners in the New Hufbandry. They muft not be furprifed if their firft crops do not anfwer their wifhes: but the deeper they plough at firft, the greater fuccefs they may juftly expect afterwards. In the mean time they muft fuffer patiently the inconvenience I have been fpeaking of, or remedy it by ufing a great deal of manure.

" Would it be reafonable to defire greater advantages than thofe we have proved above? any man of fenfe may furely be fatisfied with them: but through what fatality does it happen, that infinite numbers will not, or cannot fee them? I know, for inftance, that, excepting a certain number of perfons who have ftudied the New Hufbandry thoroughly, or practifed it with care, it is generally thought in this country, that the field Numb. II. which I have been fpeaking of, has produced me lefs corn than it would have done if it had continued to be cultivated in the old way. Whence does this notion arife: furely from this, That men are apt to judge too precipitately, without examining fufficiently, or calculating right. Whoever really wifhes to be informed, and defires to promote the public welfare, and his own private good, may eafily attain thefe ends: but it muft be by a different road from that which is commonly purfued: it muft be by reckoning and calculating, as I have done with regard to the field in queftion.

" Some fields will not yield fo much as this has done: but yet their produce will be fuch as muft determine all unprejudiced perfons in favour of the New Hufbandry, as I fhall demonftrate by the calculations in the third and fourth articles.

EXPERIMENT, Numb. III.

N. B. The field on which this experiment was made, contains about an acre and a half of ground. I have joined it to that of the experiment Numb. VII. under which its produce is included.

EXPERIMENT, Numb. IV.

Sowed		lb.	oz.		lb.	oz.
In 1753		181		reaped	3370	
1754		268	14		4972	8
1755	1ft half	488			5850	
	2d half	488			2080	
1756		816			3640	

Year 1755.

" One half of this field was laid out in beds in 1753, and the other half not till 1754. I fhall begin with the oldeft, from which I ought to expect the beft crop, as that ground was the beft prepared. It was fowed on the twenty-feventh and twenty-eighth of Auguft, with 488 pounds of wheat. This was a confiderable increafe of feed. I judged it neceffary, and fo it proved; for it preferved this field from being greatly hurt by the froft in winter, which deftroyed a great number of plants. If they had not been fo thick fown, I make no doubt but that the crop would have been confiderably diminifhed. This half was reaped on the eighteenth of July, and yielded 5850 pounds of very fine grain. Here is a crop confiderably greater than the former. It exceeds the firft by 2480 pounds.

" The other half of this field now bore its fecond crop. The fame quantity of feed (418 lb.) was fown, but did not produce fo much as in the other half. As this part lies in a bottom, the froft hurt it more than it did the other, nor had it been fo long laid out in beds; befides which, the rains hindered me from fowing it at the fame time as the other half. It could not be fowed till the twenty-firft, twenty-fecond, twenty-third, and twenty-fourth

fourth of October, which is somewhat late. It was reaped on the nineteenth of July, and yielded 2080 pounds of wheat.

Year 1756.

" This field was sowed on the ninth, tenth, and twelfth of September, with 816 pounds of wheat, and reaped on the twenty-eighth and twenty-ninth of July. The produce was 3640 pounds.

OBSERVATIONS.

" One might justly be surprised at the scantiness of this crop, if, besides what I said before of the general causes which were so prejudicial to the crops of this year, I did not add those which may have more particularly affected this field. My intention was to sow it thicker than it chanced to be; through the fault of the sower, who did not follow my directions. The hurt might perhaps not have been great, if the seasons had proved kindly: but it was of considerable consequence this year, and particularly in this field, in which all the corn was extremely rickety.

EXPERIMENT, Numb. V.

Sowed	lb.	Reaped lb.
In 1753	139	2205
1754	224	2283
1755	388	2600
1756	544	2700

Year 1755.

" This field still continued to be difficult to bring to good tilth; and therefore required the more seed. It was sowed on the twenty-ninth of August, reaped on the twenty-ninth of July, and produced 2600 pounds of grain.

Year 1756.

" I thought it necessary to continue to increase the seed of this field. It was sowed on the 20th and 22d of September, with 544 pounds of wheat. The young plants looked very fine before winter, and promised better than those of the preceding years. The general accidents of the year affected them. They were reaped on the twenty-sixth of July, and yielded 2700 pounds of corn.

EXPERIMENT, Numb. VI.

Sowed		lb.	Reaped lb.
For 1753		45	724
1754		82	798
1755	wheat	162	900
	barley	12	nothing
1756 beans and tares 153: value in wheat 780			

Year 1755.

" This field one of those in which the stiffness of the soil resisted longest that degree of pulverisation in which the chief merit of the New Husbandry consists. The first crops were not considerable. In 1754, I could not sow this ground before the fifteenth of October, and yet the plants which it produced were very fine. It was reaped on the twenty-first of July, and produced 900 pounds of wheat.

" The most remarkable thing in this field, was what happened to some beds which I had sowed with twelve pounds of barley. The young plants were exceeding fine in autumn, but the hard frosts of the winter killed every one of them.

" As soon as I perceived this loss, I endeavoured to repair it, by sowing the same beds again with spring barley: and as the two wheat beds next to them had likewise suffered so much as to have but few plants left, I sowed them also with barley.

" These beds were sowed without being ploughed again. The whole charge of this second sowing consisted in passing the drill once over them, and in twenty-eight pounds of barley which was used for the seed. This was done on the eighth of April.

" This barley grew very fine. It was reaped on the first of August, and yielded 270 pounds of grain. I doubt whether that which was sowed before the winter could have produced more: so that I think this crop made me ample amends for the loss of my first seed.

" How great a proof is this of the excellence of the New Husbandry! and how easy a means does this husbandry afford of guarding against dearth, when our young crops chance to be destroyed, by the facility with which the same lands may be sown again, without loss of time, and with scarce any more expence than the bare cost of other seed, which in such times of general distress, will produce crops of other useful grains, even more profitable than those of wheat! An inestimable advantage, which secures the subsistence of the people, and which cannot be obtained by the Old Husbandry. This must be evident to every one who considers that all that is requisite, in such a case, in the New Husbandry, is only to sow again: whereas in the old way, the Husbandman is obliged to plough before he sows, to sow a great deal of seed, and to harrow that seed in after it is sown. The vast saving made in the seed, in the new way, is likewise another very important article in a time of scarcity.

" I reason here upon a supposition of the total loss of all the crops of wheat, which really was the case in 1709.

Year 1756.

" I reserved this field in order to sow it in the spring, with the grain of that season, with which I had not yet made my experiment, except in small spots of ground. I ploughed it before winter: the new beds were well made, and the earth was in such fine tilth in the spring, that I thought I might safely sow it without any farther ploughing. Accordingly I did so on the 26th of April; the too great wetness of the earth not permitting it to be done sooner. One half of this field was sowed with beans, and the other half with tares; in all, 153 pounds of both, which produced a crop equal in value to 780 pounds of wheat.

OBSERVATIONS.

" This year was extremely bad for all grains sown in the spring; most of which yielded but the value of the seed; so that the produce of this field, compared to that of others cultivated in the old way, ought to appear very considerable.

" The success of this experiment shews, that when too much rain, or too great drought, hinders ploughing the land in due time, and some fields cannot be prepared for wheat in the autumn, they may be sowed in the following spring, with the different grains usually planted in March.

EXPERIMENT, Numb. VII.

Sowed.	lb.	Reaped lb.
For 1753	412	2646
1754	360	2467
1755 including the experiment, N° III.	639	4290
1756	1010	6760

Year 1755.

" The soil of this field is of such a nature as to require a greater quantity of seed than many others. I shall doubtless be thought to have increased considerably, in having enlarged that quantity to 639 pounds: and yet this year's experiment makes me judge, that it will still be necessary to sow more another time.

" I sowed this field on the 9th, 10th, and 26th of August, and reaped it on the 16th and 17th of July. It yielded 4290 pounds of grain.

Year 1756.

" I have a meadow adjoining to this field. I ploughed up part of it, which had produced but very little grass for a long time, and turned it into arable land. This addition served to replace another part of the field, which I sowed with lucerne. This last part being less than that which was added from the meadow, the field may have been enlarged about two acres, and the soil is much the better for it.

" This field was sowed with 1010 pounds of wheat, on the 10th, 13th, and 15th of September, and was reaped

reaped on the 23d and 24th of July, when it produced 6760 pounds of corn.

EXPERIMENT, Numb. VIII.

		lb. oz.		
For 1754	were ſown	76 8;	which yielded	1462
1755		157		1300
1756		230		2080

Year 1755.

"This great increaſe of the quantity of ſeed might be wondered at, if I did not obſerve that this field was ſowed with two bouts of the drill-plough; by which means each bed (for they were all wide enough to admit of it) had ſix rows of plants inſtead of three, and conſequently took up double the quantity of ſeed. The event will ſhew that I was right in ſo doing.

"The field was ſowed on the 31ſt of Auguſt, with 157 pounds of wheat. Nothing could make a finer appearance than this corn did at the beginning of winter. The plants, which had already branched very abundantly, made the ground look ſurpriſingly thick covered. The ſtrength of the ſtems, and the deep green of the blades, made me expect extraordinary ſucceſs. They continued thus promiſing during all the winter; and the ſame in February and March, and to the middle of April.

"The ſoil of this field is excellent: but it could not be preſerved from the fatal effect of the ſevere froſts in winter. I was extremely ſurpriſed when, going thither on the 27th of April, I found this wheat, which I had ſeen twelve days before without the leaſt ſymptom of decay, reduced to a moſt deplorable condition: not a ſingle ſtalk remained that was not dead, nor a blade that was not withered. Both the ſtalks and the blades adhered ſo little to the plants, that one might rake them up in heaps, like graſs that has been mowed: in ſhort, nothing could be more melancholy than the appearance of this field.

"The earth was extremely dry, and the weather very hot for the ſeaſon: from the 16th to the 24th of April, M. de Reaumur's thermometer was always, at ſeven o'clock in the morning, at from fifteen to eighteen degrees above the freezing point. I am apt to think that this uncommon temperature of the air compleated what the hard froſts had begun, and which I did not perceive before.

"My firſt thought was, to ſow the field again with barley, as I had done in the caſe of the experiment, Numb. VI. but ſeeing that the diſaſter was general, I examined moſt of the plants with great attention. I ordered the earth to be dug, and found ſome plants quite dead, and others, in pretty great number, which had ſtill ſome vigour, and were provided with very good roots, and of which only the ſtems and blades had periſhed. This gave me ſome hope; which was not a little ſtrengthened by my perceiving that ſeveral of theſe plants were ready to produce new ſhoots, ſome of which could juſt be diſtinguiſhed by their white point, ſcarcely perceptible; others were about the 12th part of an inch long, and others a quarter or half an inch: theſe laſt began to look green.

"Several reaſons induced me to think that theſe plants might ſtill be ſtrong enough to produce new ſtalks, eſpecially if a little rain ſhould chance to fall. I therefore reſolved not to ſow this field again. Fortunately, a good ſhower of rain fell on the 29th, which did them wonderful ſervice. I went to ſee them ſoon after, and found the new ſhoots conſiderably grown: upon which I determined to cultivate the beds with care. By the middle of May, the plants were grown very fine, were loaded with blades and ſtalks, and only ſeemed much thinner than in the autumn: the ſtraw was as long, and the ears were as big, and as full of grain, as the year before. I was obliged to reap this corn early; becauſe, as the heat of the weather had precipitated the ripening of the grain, it might have ſhrunk and ſhrivelled if I had let it ſtand ſome days longer. It was cut down on the 17th of July, and yielded 1000 pounds of grain.

"I am perſuaded that this accident diminiſhed the crop by above half; and this is certainly the reaſon why it produced leſs than that of 1754.

"The ſhape of this field was irregular on the north ſide. The length of the beds in that part decreaſed progreſſively, ſo that thoſe next the end were not above three or four fathoms long. This made the tilling of them very troubleſome, becauſe of the frequent neceſſity of turning the plough. I ordered this triangular part, which was about the third of the field, to be ploughed for ſowing in equally diſtant rows with the drill-plough. The reſt was preſerved in beds, as in the preceding years.

"I ſowed it on the 17th of September, with 230 pounds of wheat, which was reaped on the 24th of July, and yielded 2080 pounds of grain.

EXPERIMENT, Numb. IX.

		lb. oz.		lb.
For 1754	was ſowed	249 12;	which yielded	2925
1755		312		1362
1756		295		2219

Year 1755.

"This field, which had been well prepared, was ſowed on the 27th of Auguſt, with 312 pounds of wheat, which grew very fine and thick till November: but from the 10th to the 18th of that month, a general ruſt ſeized it. I imputed to this diſtemper the ſmallneſs of the crop, which amounted only to 1362 pounds.

Year 1756.

"The ground was extremely well prepared, and better than in the preceding years. It was ſowed on the 24th of September with 295 pounds of wheat, which produced 2219 pounds. It was reaped on the 21ſt of July.

EXPERIMENT, Numb. X.

		lb.		lb.
For 1754	was ſowed	294;	which yielded	3055
1755		397		2210
1756		rye 348		2700

Year 1755.

"This field was ſowed on the 30th of Auguſt, with 397 pounds of wheat, which produced 2210 pounds. I make the ſame remarks on this experiment, as on the preceding, Numb. IX. year 1755.

Year 1756.

"Though it is not uſual for me to ſow rye, becauſe all my lands are fit to bear wheat, I was willing to make a trial with that grain; and accordingly I ſowed this field with it, on the 16th of September. The quantity employed was 348 pounds. The ſtraw was very long, and much thicker than that of rye in the common way: the grains alſo were conſiderably larger. It was reaped on the 19th and 20th of July, and yielded 2700 pounds of grain.

EXPERIMENT, Numb. XI.

Performed by the ſame Perſon who made thoſe of 1754, marked with the ſame Number, and thoſe of 1753, marked Number IX.

"Though the following extract does not agree exactly with the title of this article, I was unwilling to make it a ſeparate one. It contains very intereſting details: the moſt eſſential circumſtances are related with great preciſion; and the conſequences of the reſults are eſtabliſhed by very inſtructive calculations. They ſhew the writer of them to be a ſtudious huſbandman, a very ſkilful naturaliſt, a zealous lover of the public good, who inſtructs by his example, and ſtill more by his knowledge.

"Theſe experiments were made about fifteen miles from Geneva, in a country where it is the cuſtom to ſow the land two years running. The firſt year it is ſowed with wheat; the ſecond, with ſpring corn; and the third it is reſted.

Extract of a Letter to M. de Chateauvieux, *dated* December 7, 1755.

'I received the journal of your laſt year's experiments, 'and have read it with very great pleaſure. If it were 'poſſible for me to make any obſervation of the leaſt im'portance, upon your experiments, which had eſcaped 'you, I ſhould take the liberty to lay it before you, in 'full confidence of your receiving it kindly.

'In general, I aſcribe, as you have done, the different 'ſucceſs of the New Huſbandry, 1. To the intrinſic 'quality of the ſoils, ſome of which ſeem unfit for the 'production of wheat: 2. To the condition of the lands, 'when they firſt began to be cultivated in the new way: '3. To the manner in which they were prepared, ac'cording to the principles of this huſbandry: and laſtly, 'to the quantity of ſeed that was uſed.

'I was particularly pleaſed with your experiment on 'the barley. It is certainly very inſtructing, and con'firms what I before ſuſpected, that in our climate, 'wheat and other plants love ſociety; and that they 'thrive better when numbers of them are planted to'gether, than they would do ſeparately, provided that 'number be not too great. You will certainly not fail 'to repeat that experiment in years leſs hot and leſs dry, 'and upon other plants. Still I am afraid that no fixed 'rule can ever be given with regard to the quantity of 'the ſeed: too many circumſtances influence the con'dition of the ſoil: but it will always be of great ſer'vice to fix certain bounds, within which every one may 'chooſe what ſuits him beſt.

'You will ſee by the account of my little experiments, 'that I have ſowed in the ground of my rows, nearly 'what would have been ſowed by hand in the ſame ſpace. 'But the imperfection of my drill-plough, and the con'dition of my land, obliged me ſo to do; and I have not 'hitherto found any inconvenience from it.

'I ſhorten my reflections, and proceed to my experi'ments.

Produce of the firſt and ſecond Crop of a Field cultivated in the new Way.

'This field contains, according to our meaſure, ſix 'poſes, which are equal to very near four acres and a 'half. The ſoil of it is tolerably good; rather light 'than ſtrong; fitter for rye than wheat. I am the firſt 'that ever ventured to ſow it with wheat. Dung uſed 'to have a great effect upon it for the firſt crop, but the 'ſecond ſeldom ſucceeded: in ſhort, it was the general opi'nion, that nothing could be made of this field without 'the help of a deal of good manure.

'It was well dunged in 1749, and ſowed with maſlin 'corn. The year 1750 was very favourable to corn in 'general, and particularly to that of this field. It yielded 'as much as two middling crops; that is to ſay, ten for 'one: but being ſowed again the ſame year, it yielded, 'in 1751, but two and a half for one. The year 1752 'was the year of reſt, or rather it was ploughed that 'year, according to the old method, and ſowed the 'broad-caſt way, but without dung. The autumn was 'not kindly: the plants roſe poorly: and the crop of '1753 yielded ſcarce three for one, after deducting the 'tythe. It was after this crop that this field was laid out 'in beds of ſix feet wide, and ſowed in the ſame year 'with wheat. As the mould of theſe beds could not be 'prepared properly, and the year 1754 was but a poor 'one for wheat, I was not ſurpriſed at the ſcantineſs of 'the crop. I ſowed twelve of our meaſures, and reaped 'ſeventy-two. Our meaſure of wheat weighs, when it 'is good, twenty-eight pounds; and that of maſlin 'twenty-ſix pounds. I did not weigh mine every year; 'but I am ſure it was always full weight.

'Encouraged, rather than diſheartened, by this trial, I 'ploughed theſe beds up for a new crop, and ſowed them, 'part with maſlin corn, and part with wheat.

'The ſummer of 1754 was ſo dry, that I deferred 'plowing the ſummit of the beds which had borne their 'crops, till the end of autumn. This was attended with 'theſe two inconveniencies: firſt, that the intermediate 'earth, which had been well pulveriſed, being no longer 'ſupported as before, ſlipt away from under the drill, and 'ſpread to the right and left; by which means the plants 'had leſs depth of good mould left, and I loſt part of the 'advantage I hoped for from this culture. The other in'convenience was, that the beds being no longer ſo high 'raiſed as they ſhould have been, the firſt ploughing in 'autumn covered their outmoſt rows in ſeveral places: a 'loſs, by ſo much the more conſiderable, as the rows ſo 'buried would, by their ſituation, have otherwiſe been 'the fineſt of all. I certainly under-rate it, in valuing 'it at only a tenth part of the crop.

'As maſlin is a much quicker grower than wheat, 'and being uncertain whether it could do without dung; 'out of eighteen beds, I dunged twelve, but very ſlight'ly; juſt as I would have dunged the third part of this 'ground, if I had intended to ſow it in the broad-caſt way.

'I ſowed it on the 4th and 5th of October, 1754, with 'two turns of the drill-plough, and very thick, by reaſon 'of the imperfection of my drill, and becauſe the ſeaſon 'was already ſomewhat advanced. A third more ſeed 'was ſowed this year than laſt, viz. eighteen of our 'meaſures.

'The plants roſe well, the rows looked very thick and 'well filled, except thoſe which were hurt by the firſt au'tumnal ploughing, and by cattle which broke in upon 'the ground, and did a deal of damage.

'The plants in the part which had been dunged, were 'very fine all the winter. In the beginning of April they 'grew with ſurpriſing vigour, and were as beautiful as 'could poſſibly be in May and June. They were ſo 'tall, that they hid my plough and horſes, and ſeemed 'to promiſe three times more than the other plants where 'the ground had not been dunged. Theſe laſt grew 'more ſlowly: but juſt before harveſt, they puſhed 'ſtrongly; and if their ſtraw was not ſo long or ſo thick 'as that of the former, there was ſcarce any difference in 'the length of the ears: and the difference of the product 'was but one-fourth in favour of the dunged plants.

'Both the one and the other ſuffered on the 23d of 'May, by a violent north-eaſt wind, which broke a great 'number of the ſtalks of the rye, and tore others up by 'the roots. The ſtalks that were not quite broken, re'covered perfectly, and the loſs was not great with re'ſpect to them. The caſe was different in regard to the 'plants that were broke aſunder or torn up. I reckoned 'the damage ſuſtained by theſe laſt, equal to a tenth part 'of the crop.

'Of the forty-ſeven furrows of this field, eighteen ſowed 'with maſlin yielded me (excluſive of the tythe, which is 'an eleventh part) ſixty of our meaſures. This grain is the 'fineſt of its kind in the whole country, and is equal to the 'common wheat. The meaſure weighed, in the drieſt and 'coldeſt ſeaſon, twenty-ſeven pounds; which is a ninth 'part more than the weight of the common maſlin.

'The twenty-nine furrows ſowed with wheat ſeemed 'to have eſcaped the violent froſts of the winter: but I 'was greatly ſurpriſed in April, to ſee large ſpaces in 'which the plants periſhed daily; and others wherein the 'wheat ſeemed to have diſappeared, to make room for a 'prodigious quantity of ſenvy, which looked extremely 'well.

'I was not at all pleaſed with this change of crop: yet 'though I no longer expected any thing from theſe da'maged places, which amounted to the value of nine 'furrows, I would not give up the good plants which I 'thought might ſtill be in them; and therefore ordered 'them to be weeded carefully, ſeveral times over, by wo'men who deſired only the weeds for their labour. This 'operation was not uſeleſs: the ſurviving plants gathered 'new ſtrength: they branched conſiderably in June; and 'yielded me, at harveſt, about a third part of what I 'reaped from the places which had not been damaged. 'Theſe laſt ſeemed but indifferent during all the ſpring. 'Every one judged this corn inferior to that of the fields 'which had been ſown in equally diſtant rows and dunged: 'but, from the beginning of June, when the other wheat 'began to decline, my rows throve ſo well, that ſome 'parts of them were very greatly ſuperior, both in the 'length of the ſtraw, and the bigneſs of the ears, which 'laſt were every where longer and better filled.

'Notwithſtanding all this, my wheat had ſtill more to 'ſuffer. It was cut juſt before the heavy rains in July, 'and

'and some of it sprouted, as was the case elsewhere. Besides the loss in the quality of the grain, my threshers reckoned that the quantity of it was diminished eight measures. The whole produce was but sixty-eight measures, after deducting the tythe.

'I have entered into this detail, in order to make the following remarks.

'1. As this field, twelve furrows excepted, was not dunged so early as in the year 1749, the superiority of the crop of 1755 over that of 1754, must be imputed chiefly to the New Husbandry. The places on which my finest wheat grew, were not at all extraordinary in 1754, and yet they were not dunged for 1755; consequently the culture, far from exhausting, meliorated the ground.

'2. Some soils are fitter to produce some grains than others; and it is in vain to attempt to force nature. Notwithstanding the good culture, the bad part of my field was yet worse than in 1754; but the senvy in it was finer. I sowed this part with grass, which still covers it, and is very green and vigorous. I judge that radishes or turneps would do very well there.

'3. One must not always judge of a crop by the appearance of the green corn in April and May; because the dung then exerts its greatest strength for the production of the blades, and that appearance is oftentimes deceitful.

'4. The last ploughings ought, if possible, never to be neglected: it is to them that I ascribe the favourable change which happened to my wheat.

'To follow your method, I have now only to compare the produce of this field, with what it yielded when cultivated in the old way. I have not been able to find its exact produce before the year 1750. All I know is, that the crops varied extremely, according as the ground had, or had not been dunged, or the year was more or less kindly.

'I shall therefore estimate the produce of this by that of the neighbouring fields, which are thought to bear a good crop, when a pose of land yields thirty-two of our measures, after deducting the tythe and seed corn. The next crop, whether it be of winter or spring corn, is seldom worth half the first: however, supposing it to be sixteen measures, as the land is rested the third year, the neat produce of the crop for three years will be forty-eight measures, which is sixteen measures a year, and ninety-six measures for the six poses.

'I had, in the new way, 128 measures of wheat and maslin; deducting from which eighteen measures for the seed, there remain neat 110 measures, and a profit of fourteen; for which I am indebted to the New Husbandry.

'If we add to this the eight measures lost by the sprouting of the grain, and the damage done by the ploughing in autumn, it will appear, that, without those two extraordinary accidents, I should have had thirty-five measures more than could have been expected in the old way, and that of a corn, which, supposing all other things equal, is worth twelve per cent. more than any of the common growth.

'I make no doubt, but that if I were to lay in my furrows the dung that is spread yearly upon my lands, and were to take all the precautions necessary to sow and cultivate them properly, the neat produce would be thirty measures, one year with another, which would be a continual plenty.

'However that may be, thus much is certain in favour of the New Husbandry, that, notwithstanding all the accidents, my field produced the second year about double the quantity that it did the first."

First Year's Produce of a Field sowed and cultivated according to the New Husbandry.

'This field contains about three acres and a half. It was divided into beds five feet wide, which were sown alternately with one and with two bouts of the drill-plough; that is to say, with three rows and with six. The ploughings had been but badly performed, and the beds were not raised or arched so high as they should have been. Those that were sown double, that is with six rows, were always superior to the rest. As the soil of this field is generally strong, and fit for wheat, it did not afford the same variations as the former, though some of this wheat sprouted.

'I sowed seventeen measures, and reaped ninety-two, besides the tythe. By the same calculation as before, the neat produce was one measure less than in the old way.

'But it is to be observed, 1. That by the sprouting of the grain, I lost more in this field than in the other. 2. That this was not a good year for wheat. 3. That this field, being bordered by two high-ways, and not being inclosed, was greatly damaged by cattle that got into it. 4. That what grain I did reap was clean, and suffered scarce any diminution by sifting. 5. That if I had sowed all my beds with six rows, I should probably have reaped a fourth part more; so that no blame ought to be imputed here to the New Husbandry. 6. That it is the first year of my trying this husbandry; that my ground had been but very imperfectly prepared, and that it is now in a much better condition for the next crop, though my servants have again committed several blunders. All these considerations seem to me farther proofs of the excellency of the New Husbandry.

'I could prove, that, in point of profit, this last field has yielded me three times as much as it used to do in the old way, and the other field twice as much.

'This may more than suffice for such small experiments as mine. I could wish that they had been greater, and the success more complete. With what pleasure should I offer them to you, whom I look upon as the chief and patron of all who follow the true principles of agriculture!

'Though I have sowed the bad parts of the first field I spoke of with grass, I have added three poses more to the arable against next year, in order to cultivate them in the new way, which I purpose extending to all my lands the next sowing season.

'I have very injudiciously, I doubt, sowed between twelve and thirteen poses with grain which had sprouted. I do not believe the third part of it has come up; but as I sowed thick, and my lands are much better prepared than they were last year, I hope to have at least as good a crop.'

OBSERVATIONS.

"When experiments have been repeated in different places, the circumstances attending them ought to be greatly considered: for if these have been alike, and the event is the same, they serve to establish one another, and merit our confidence in them. The comparison of the last experiments with mine, gives me room to make two important observations. The first is, that both of us have perceived, and for the same reasons, the necessity of sowing a greater quantity of seed than we did in our first experiments. This augmentation produced better crops. We may therefore now lay down as a rule founded on experience, that the quantity of the seed must be what we said in our last accounts, regard being had to the particular considerations mentioned therein.

"The second observation is, that both of us have sowed beds with two bouts of the drill-plough, that is, with six rows of corn; and the event in both cases has been, that the same extent of ground has always produced a greater quantity of grain. It is therefore probable that this method will be found to be the best.

"But as it is possible that the effect may not be the same in different countries, a trial may be made by sowing some beds with three rows, and others with six, and which ever answers best, may afterwards be practised.

"These two observations will be confirmed by some experiments which we shall give in the fifth article.

"Other business prevented this lover of agriculture from following his experiments in 1756, with the same attention as before. The exact, though short, account which we shall give of them, may serve for a sequel to what we have been able to collect in relation to those which he made in 1755.

Year

Year 1756.

"In the firſt place, the field of ſix poſes, or four acres and a half, which bore a crop in 1754, and another in 1755, and which had not been dunged at all ſince the year 1749, being ſurrounded by a greater piece of land, which is ſowed ſometimes with wheat, and ſometimes with artificial graſſes, was ploughed in Auguſt, immediately after harveſt, and ſowed with ſain-foin. The crop of 1756 was very fine, each poſe yielding from twenty-five to thirty hundred weight of hay at the firſt mowing, and half as much at the ſecond. Therefore the New Huſbandry preſerved the ground in good condition, without the help of dung; and its productions do not ſeem to have exhauſted the ſoil.

"The field of about three acres and a half, ſowed with wheat, and which produced ninety-two meaſures of that grain in 1755, produced but ſixty-one in 1756. The inferiority of this crop muſt be aſcribed, 1. To the error of ſowing wheat that had ſprouted, which, in the opinion of all judges, occaſioned a diminution of at leaſt one fourth: 2. To the damage done by cattle (this field lying quite open to them) which was greater this year than it had ever been before, part of the green corn being eaten down twice. This loſs is valued at a tenth part of the crop, independent of the tythe. 3. That the ears were not ſo full of grain this year in this country as they uſed to be: that there was as much ſtraw within ſeven truſſes and a half as in 1755; but the corn ran leſs into grain, though it ſtill had more than the common wheat.

"Upon the whole, all loſſes and accidents deducted, the crop was worth double what the land would have let for.

"This field is now under wheat, which looks extremely fine, excepting one poſe, which muſt be ſowed again with ſomething elſe, on account of the damage the cattle have done to it. The owner of this field intends to continue ſowing it without dung as long as any heart remains in it, in order, ſays he, to confirm myſelf in what I now think, or to find out my error, if I am miſtaken.

"Another field of betwixt nine and ten poſes (equal to about ſeven acres and three roods) produced 160 meaſuers of wheat; but ſome loads of dung had been laid upon it. However, even the places which had not been dunged produced much ſtronger ſtraw than they did the years before, in which they were ſown by hand. It is true, that the dung made the ſtraw ſtronger, but the ears did not yield either more or finer grain. This was likewiſe ſowed with ſprouted corn; but the ſeed was better this year, and accordingly there is a proſpect of a greater crop.

Experiments made on Lands ſown in equally diſtant Rows with the Drill-Plough; with ſome Reflections on the Advantages of this Practice.

EXPERIMENT, Numb. XVII.

"A large extent of land, near Geneva, continued to be ſown with the drill-plough, in equally diſtant rows. I could inſtance the products of a multitude of experiments, to prove that the fields ſowed in this manner, have always produced much greater crops than thoſe which have been ſown in the common way.

"I ſhall mention only a few experiments this year: but they are ſuch as have been made on large tracts of ground, and conſequently are more deciſive than ſmall ones, of which we have already given a ſufficient number in the foregoing journals.

"I ſhall call this Numb. XVII. becauſe it was made by the ſame perſon, and in the ſame places, as that which is marked Number XVII. in the year 1754. I need not repeat what I then ſaid of the ſituation and quality of the land.

"This experiment contains the products of three different farms. About ſeventy acres were cultivated in the firſt, thirty-four in the ſecond, and twenty-ſix in the third: in all 130 acres, which were ſown with wheat in September and October.

Year 1755.

"Quantity of ſeed generally uſed in the old way.	Firſt farm	16002 lb.
	Second farm	7560 lb.
	Third farm	5922 lb.
	Total	29484 lb.
"Quantity of ſeed uſed with the drill-plough.	Firſt farm	7812 lb.
	Second farm	3276 lb.
	Third farm	3150 lb.
	Total	14238 lb.
"Saved in the ſeed - - - - - -		15246 lb.
"Crops of 1755.	Firſt farm	80210 lb.
	Second farm	27690 lb.
	Third farm	27040 lb.
	"Total of the crops	134940 lb.
"To which if we add the ſaving in the ſeed, viz. - - - - - - - - - -		15246 lb.
"The whole produce will be - - -		150186 lb.

"I ſhall now examine what theſe three farms would have produced if they had been cultivated in the old way, ſuppoſing their crops to have been equal to thoſe of 1754; which is much in favour of the Old Huſbandry.

"I find that theſe three farms, which contain about 130 acres, and which would have required 29484 pounds of ſeed, would have produced at moſt from 75000 to 80000 pounds of wheat; which is 54940 pounds leſs than what was reaped in the new way. The following calculation of the real and effective products in both ways, deducting from each the neceſſary quantity of ſeed, will ſhew the advantage of the New Huſbandry in a yet ſtronger light.

NEW HUSBANDRY.

Total produce	134940 lb.
To be deducted for the ſeed	14238 lb.
Neat produce,	120702 lb.

OLD HUSBANDRY.

Total produe,	80000 lb.
To be deducted for the ſeed	29484 lb.
Neat produce,	50516 lb.
Conſequently the balance in favour of the New Huſbandry is,	70186 lb.

"This may perhaps ſeem ſurpriſing to many: but my calculation may be more ſafely depended on, as I have favoured the Old Huſbandry greatly in my eſtimate of the crops in that way, and have made no deduction for the loſs by ſifting, winnowing, &c. which, even in the very beſt years, is always conſiderably greater in the Old Huſbandry, than in the New.

Year 1756.

"The ſame farms continued to be ſown with the drill-plough. I ſhall therefore repeat the ſame calculations, to ſhew the conſtant advantage of the New Huſbandry, which is ſo much the more remarkable this year, as the corn in the common way yielded but very bad crops. The fields in general produced but few ſheaves, and the ſheaves very little grain, and even that was very poor in many places.

"About ninety acres were cultivated in the firſt farm, for the crop of this year; in the ſecond thirty-four, and in the third forty-five: in all 169 acres, which were ſown with wheat in September and October. About thirty of theſe acres had been dunged.

"Quantity

"Quantity of ſeed generally uſed in the old way	Firſt farm	20160 lb.
	Second farm	7560 lb.
	Third farm	10080 lb.
	In all	37800 lb.
"Quantity of ſeed uſed with the drill-plough	Firſt farm	9828 lb.
	Second farm	3654 lb.
	Third farm	5040 lb.
	In all	18522 lb.
"Saved in the feed		19278
		37800 lb.
"Crops of 1746.	Firſt farm	79560 lb.
	Second farm *	19110 lb.
	Third farm	31590 lb.
"Total of the crops		130260 lb.
"To which if we add the ſaving in the ſeed, viz.		19278 lb.
"The whole produce will be		149538 lb.

"* This farm did not produce ſo much corn as it ſhould have done, becauſe near a third part of the fields was almoſt totally ruined by inundations.

"Suppoſing this accident not to have happened, what might theſe fields have produced? If they had been ſown in the common way, they would have yielded leſs grain than in the two preceding years. I have eſtimated it at ſomewhat leſs than that, and the advantage is ſtill in favour of the New Huſbandry. Theſe three farms would have produced at moſt from 88000 to 93000 pounds of wheat; and, according to this eſtimation, which I think a great allowance, the whole crop would be 37260 pounds leſs than it was.

"To ſee the exact reſult, let us continue our calculations, deducting the grain that was uſed for ſeed.

NEW HUSBANDRY.

"Total produce	130260 lb.
"To be deducted for the ſeed	18522 lb.
"Neat produe	111738 lb.

OLD HUSBANDRY.

"Total produce	93000 lb.
"To be deducted for the ſeed	37800 lb.
"Neat produce	55200 lb.
"Conſequently the balance in favour of the New Huſbandry is	75060 lb.

"All theſe calculations prove, year after year, the advantage of uſing the drill-plough. To ſhew how great that advantage is, I ſhall briefly recapitulate what is moſt eſſential in this article.

RECAPITULATION.

"We have ſeen a very conſiderable experiment repeated three years running, and always attended with great ſucceſs. I ſhall now ſum up the eſſential and deciſive facts, which are ſo many unexceptionable witneſſes, who depoſe, That it is much more profitable to ſow lands with the drill-plough, than to ſow them in the common way.

"To this end, I reſume the neat products of the crops.

NEW HUSBANDRY.

Neat produce of the three farms.

	Pounds.
In 1754.	93418
1755.	120702
1756.	111738
"Total neat produce of three years	325858

OLD HUSBANDRY.

	Pounds.
In 1754.	62200
1755.	50516
1756.	55200
"Total neat produce of three years	167916
"The difference in favour of the New Huſbandry, in three years amounts to	157942

"This is an object of great importance, not only to the public, whoſe welfare it highly concerns, but to every owner of land. How ſtrongly does it ſhew the vaſt advantage of the drill-huſbandry! We here ſee 169 acres of land produce 157942 pounds of wheat more than they would have done without this favourable culture.

"Any one may eaſily reckon the value of ſuch a quantity of wheat, ſuppoſing it to be of the very beſt ſort, as it really was.

EXPERIMENT, Numb. XVIII.

"I ſhall now give a ſhort account of the ſucceſs of another farm, which I have hitherto ſowed in equally diſtant rows, with the drill-plough. I generally ſow about twenty-three or twenty-four acres of it every year. For the crop of 1755, I uſed 1840 pounds of ſeed corn, which produced 10400 pounds of grain. For the crop of 1756, I ſowed 2772 pounds of wheat, the produce of which was 14560 pounds, which is a great deal, conſidering the quality of the land.

"I ſhall conclude this article with a ſhort detail of two little experiments made by the perſon I laſt ſpoke of, on two fields of different ſoils. The firſt, which contained about two acres, was a light ſoil, and ſomewhat ſtony. The quantity of ſeed generally uſed for that ground, was about 380 pounds weight. It was ſowed very thick, with the drill-plough, and took up 252 pounds of ſeed. I attended carefully to the progreſs of this corn. It ripened well, the ſtraw was very long, and crowned with fine ears, which yielded 2835 pounds of grain.

"The ſecond experiment was made on a ſtiff ſoil. Half the field was ſown in the common way; and the other half in equally diſtant rows with the drill-plough, and only two-thirds of the uſual quantity of ſeed was uſed. This laſt half yielded double what the other did, though it was ſown with a third leſs ſeed.

"The deſign of the following article is, to ſhew that lands which are laid out in beds according to the New Huſbandry, produce more corn than thoſe which are only ſown in equally diſtant rows, with the drill-plough. The proof of this propoſition will reſult from proper calculations, and a compariſon of the products of theſe two different methods.

"It is of no ſmall importance to the public, to know exactly which is the beſt and moſt profitable way to cultivate land. This article deſerves ſtill more attention than the laſt, as it tends to point out the means that are in reality moſt advantageous, though oppoſed by an obſtinate attachment to the Old Huſbandry, and the extreme reluctance with which farmers can ever be induced to try a new practice, which they are almoſt always ready to condemn, without taking the pains to know what it is, and indeed generally, becauſe they are not able to judge of it. It cannot therefore be expected that the theory alone ſhould ſatisfy them that this huſbandry is conſiſtent with the beſt principles of agriculture. If any thing can convince them, it will be a ſeries of facts, and experiments repeated during a courſe of years, always ſucceſsfully in ſo many different places.

"It is highly eſſential to dwell upon the proofs that the Old Huſbandry is leſs profitable than the New, in which the field intended to be ſown is firſt laid out in beds: for, after ſhewing that lands ſo laid out and ſown, produce conſiderably more than thoſe which are ſown only in equally diſtant rows with the drill-plough, as has

has been demonstrated in the foregoing article; and likewise, that these last produce considerably more than they used to do in the Old Husbandry; the superiority of the crops which the beds afford, will certainly appear still more striking, and no doubt will remain of the excellence of the new culture.

" To this end, we shall compare the neat produce of the three farms mentioned in the foregoing article, in this year 1756, with that of the fields which I have laid out in beds.

" In consequence of the general opinion that dung, or any kind of manure, contributes greatly to fertilize land, and makes it produce more than it would otherwise do, it is to be observed, in the first place, that part of the land of the three farms was dunged, and that my fields, cultivated in beds, had not had any dung or other manure for many years.

" Secondly, that the lands of the three farms are always fallowed every second year; whereas my fields have been sown every year since they first began to be cultivated in the new way, and have already borne several crops running.

" Thirdly, it should be considered, that the year 1756 was extremely rainy: a circumstance by no means favourable to strong stiff soils, like mine; and at the same time rather beneficial than hurtful to the three farms, a great part of which is light land, which requires frequent rain.

" Lastly, the reader will remember, that about a third part of the second farm was overflowed, whereby the crop was diminished: but, on the other hand, I think this damage is pretty nearly compensated by the accidents which happened to my field, (experiment Numb. IV.) which certainly lessened the crop considerably.

" These reflections seemed to me necessary, in order to give a just idea of the comparison I am going to make, which, I believe, will be sufficient to prove what I purposed to shew."

Comparison of the Produce of Land sown in equally distant Rows with the Drill-Plough, with that of other Land laid out in Beds.

" The neat produce of the three farms, containing about 169 acres, which were sown in equally distant rows with the drill-plough, was, after deducting the seed,

		Pounds.
Of the	First farm — — — — —	69732
	Second farm — — — — —	15456
	Third farm — — — — —	26550
	Total neat produce —	111738

" Neat produce, after deducting the seed, of the fields laid out in beds, and sown with the drill-plough; with the number of each experiment, and the measure of each field.

					Pounds.
EXPERIMENT, Numb. 2.	—	1½ acre		—	1834
4.	—	15	—	—	2824
5.	—	7½	—	—	2156
6.	—	2½	—	—	627
7.	—	15	—	—	5750
8.	—	1	—	—	1850
9.	—	6	—	—	1924
10.	—	6	—	—	2352
In all		54 acres.			
Total neat produce in 1756				—	19317

" After the beds are once formed, the same fields are sown every year: consequently these will produce another crop in 1757, which, supposing it to be only equal to the last, though there is great reason to think it will be much better, will again be — — — — —	19317
" Fifty-four acres will then produce neat, in two years — — — — — — — —	38634

" The 169 acres of the three farms sown in equally distant rows with the drill-plough, will not produce any thing in 1757, that being their year of fallow; consequently their neat produce in two years, will have been only 111738 pounds of wheat, whilst the fifty-four acres made into beds, will have produced 38634 pounds. But supposing the 169 acres to have been cultivated in beds, and their produce to have been in the same proportion as that of the fifty-four acres, it would amount to 134769 pounds, which is 23031 pounds more than they produced when sown in equally distant rows with the drill. This difference ought never to be forgot.

" The new method of laying the land out in beds, has still greater advantages than this. Our comparison has been only of the neat produce of 169 acres, which were sown the same year in the three farms: but it is to be observed, that these farms consisted of 169 acres more, which were under fallow for the next year's crop. The neat produce of the crops of those 338 acres in the two years of sowing them in equally distant rows with the drill-plough, supposing both crops to be equal, would be

	Pounds.
For the first year, 169 acres — —	111738
For the second year, for the other 169 acres	111738
For the two years — — —	223476

" If these 338 acres were laid out in beds, they would be sown each year, and their neat produce, supposing both years alike, would be,

	Pounds.
For the first year, 338 acres — —	134769
For the second year, 338 acres —	134769
For two years — — —	269538

" So that this calculation proves plainly, that the 338 acres will produce 46062 pounds of wheat more when cultivated in beds, than when sown in equally distant rows with the drill-plough: a difference which, in ten years, will amount to 230310 pounds of grain.

" As great as this advantage is in favour of the beds, it will appear very small when compared to that which the culture in beds has over the Old Husbandry: as the following calculation will shew.

" Let us first settle what would have been the neat produce (by which we always mean that which remains after deducting the seed) of the 169 acres of the three farms, for one year; and afterwards that of the other 169 acres the next year, supposing both crops to be equal.

" We have already seen that the produce of 169 acres would, at most, not have exceeded 55200 pounds of wheat, in 1756. But as that was a bad year, I will make the following comparison on the footing of a good crop, in order to give the Old Husbandry every advantage that can possibly be desired. I will therefore suppose the neat produce of 169 acres to have been the first year

	Pounds.
	76000
And that of the other 169 acres, the next year — — — — —	76000
For the two years —	152000

" We have seen that the same 338 acres cultivated in beds, reckoning their neat produce for two years only on the footing of the bad crop of 1756, would have yielded 269538 pounds of wheat; consequently this culture would have produced in two years 117538 pounds of corn more than the Old Husbandry; and this difference, in ten years, would amount to 587690 pounds.

" The great advantage of the New Husbandry, in general, and that of laying the ground into beds, in particular, is, I think, now fully proved. The difference is great indeed! But I believe it will be still much greater hereafter, when the yearly observations of the followers of this new way, whose number increases daily, shall have brought this culture to a greater degree of perfection; which I hope will, in some measure, be the case next harvest."

Result and Comparison of divers Experiments in Agriculture made at Fontclaire, *near* Avignon, *by* M. d'Elbene, *in the Years* 1757, 1758, *and* 1759. *Communicated to* M. Duhamel, *and published by himself in his Book, entitled, Culture des Terres, Tom.* VI. *C.* I. *Art.* 17.

EXPERIMENTS *made in* 1757.

" The principles of the New Husbandry seemed to me so well established, that I resolved to practise it. To this end, I took into my own hands the farm I am now going to speak of, in 1756; and, not to burthen myself with so considerable a detail as must of course arise from the number of labourers necessary to cultivate such an extent of ground, I divided the greatest part of it into lots, which I assigned to peasants who undertook to perform by hand most of the work that was to be done, and to be at all the expence of harvesting, to the laying up of the corn threshed and winnowed, in consideration of one half of the produce.

" The share of each of these peasants was about three acres, of which one half was to lie fallow every year. They took great care to portion out the land in such manner that the good and bad were equally divided among them.

" Some fields of an excellent quality were not included in this distribution; but the farmers to whom I entrusted them promised me two hundred pounds of wheat for every acre, over and above the half of the product.

" I destined two fields, one of which was pretty good, and the other very bad, to be laid out in beds.

" M. de Chateauvieux was so kind as to send me the ploughs, drill, and cultivator, which he has invented: but I did not receive them in time for this year's preparation of the ground, which had but two ploughings.

" I began to sow a small part of my fields, according to the new method, on the 19th of August. The rest was sown before the 25th of September, and the peasants sowed theirs in the beginning of October.

" The autumn was rainy, and favourable to the rising of the corn, which made a great progress before the beginning of winter: but this season proved so very wet and cold, that my plants suffered greatly in those lands where they are apt to be forced out of the ground by frost: many of them were absolutely torn up in several fields sown according to the old way, or in equally distant rows with the drill plough; and seven or eight acres were stripped entirely of all their growth.

" The beds, being arched, escaped unhurt, because the wet did not settle upon them. Favourable weather in the spring, accompanied with gentle rains, repaired the mischief which the winter had done, wherever any plants remained.

" The wheat in the new way began to ear on the 20th of April; and that in the old way, on the 5th of May. The grain was full grown by the end of this month. Frequent rains and dews which fell in June kept the earth cool, without too much hastening the corn, which was reaped between the 21st of June and the second of July. The sheaves were very long, very heavy, and yielded plentifully in all my land: I found pretty commonly, in my beds, ears which had from eighty to ninety fine plump grains: but in my other ground, the largest did not contain above twenty-five, and part of them was shrivelled.

" The crops were but indifferent in this country, in general. They were very bad in several places; and those of my neighbours who had the best, looked upon this as a middling year. As I had found it a very good one in this farm, I was desirous to ascertain the degree of advantage arising from good culture; for I could not impute the superiority of my crops to any other cause. To this end I computed what these same lands had produced when cultivated in the same way as all others still are in these parts. I could easily do this, as my father, grandfather, and great-grandfather had kept very exact accounts of all their crops, and the original papers relating thereto are now in the hands of my father at Avignon. I there found the whole detail, year by year, ever since 1677, and carefully made from thence the following calculation.

Result of the Produce of the Lands of this Farm from the Year 1677, to 1756, inclusively.

The quantity of land sown in this space of time was	4660 acres.
With - - - - - -	875887 l.
Which yielded - - - - -	2914987 l.
The neat produce, after deducting the seed, was	2039099 l.
But as only one half of the land of this farm was sowed every year, whilst the other half lay fallow, it is evident that this quantity of corn was produced by double the land above-mentioned; that is to say, by	9320 acres.
Which produced - - - - -	2039099 l.
The farmer had half of this product, for the expence of culture. Consequently the landlord had but	1019549 l.
From whence it follows that the landlord received for each acre of land	109 l. 6 oz.

Produce, from 1677, to 1756.

" To estimate this produce in money, I suppose the price of the finest wheat to have been constantly at eight shillings and nine-pence for an hundred pounds weight, which is the medium value in these provinces. The corn of which I now speak was not worth so much; a considerable quantity of oats and rye being included in the above product, and likewise the siftings, which are, taking one year with another, from fifteen to twenty per cent. An exact calculation of the neat produce of some years proved that this diminution was from thirty-five to forty per cent. but to avoid all error, I deducted only thirty per cent. from the fixed price of the finest wheat. This gave me six shillings and three halfpence for an hundred pounds of my corn, and six shillings and eight-pence for the 109 pounds above-mentioned, which was the medium annual produce of each acre of land during the space of eighty years.

" By thus calculating the crops every year, I was enabled to know the advantage of each different kind of culture. The greatest part of my farm was sowed in the old way in 1756; a small portion of it was sowed in equally distant rows with the drill-plough, and only two pieces of ground were managed according to the principles of the New Husbandry.

Produce, in 1757, of the Land sown in the old Way.

I sowed - - - - - - - - - - - -	58 acres.
With - - - - - - - - - - -	9722 l.
They produced - - - - - - - -	55849 l.
Deducting the seed, there remained -	46127 l.
Abating half of this for the year of fallow, in which these lands do not produce any thing	23063 l. 8 oz.
And likewise the husbandman's half, I had, as landlord	11531 l. 12 oz.
So that each acre of land yielded me -	198 l. 13 oz.
Or, at six shillings and three halfpence the quintal, for the reasons before mentioned	12 s. 2 d.

Produce, in 1757, of Land sown in equally distant Rows with the Drill-Plough.

I sowed - - - - - - - - - - - -	2 acres and ½
With - - - - - - - - - - -	198 l. 12 oz.
Which produced - - - - - - -	2400 l.
Deducting the seed, there remained -	2201 l. 4 oz.
Of which abating half for the year of fallow	1100 l. 10 oz.
And deducting also the labourer's half -	550 l. 5 oz.
I had, for the produce of each acre, -	220 l. 2 oz.
Worth, at 6 s. 3 halfpence the quintal,	13 s. 6 d.

Produce,

Produce, in 1757, of the Land sown according to the Principles of the New Husbandry.

I sowed - - - - - - - - - -	5 acres and ½
With - - - - - - - - - -	110 l. 10 oz.
Which yielded - - - - - - -	4837 l. 8 oz.
Deducting the seed, there remained, -	4726 l. 14 oz.
And abating only half of this, for the husbandman's share, because this land is never fallowed, I had, as proprietor	2363 l. 7 oz.
So that my product from each acre, was	411 l. 1 oz.
Which, at 7 s. and 10½ d. the quintal, at which I rate it for the following reasons, makes	32 s. 4½ d.

" I did not think it right to deduct here the thirty per cent. from the medium price of the finest wheat, because all this last was perfect grain, quite clean, and entirely free from any mixture of seeds of weeds; whereas I had not only reaped rye, oats, and barley, among that which was raised in the old way; but the siftings there were very considerable, and the corn, even after that, was not near so fine as the growth of the New Husbandry. I deducted however ten per cent. from the price of the very best wheat, that I might not be any way partial to this method, though I sold its produce at the highest price.

" The advantage of the New Husbandry was infinitely greater than I expected. I am sure that my reckoning is right; for my lands were distributed in such manner that I could not mistake. Each peasant laid his sheaves in a separate heap, threshing them, winnowed their grain, and divided the product with me. My sheaves were also piled up, threshed, and winnowed apart, and their produce was measured before all my servants and a number of peasants, who were astonished at it.

" It is true, that I mixed the sheaves reaped from the ground sowed in equally distant rows with the drill-plough, with those of the beds: but I reckoned before hand the quantity of each, as I could easily do by means of the tythe, which is every twelfth sheaf, and made my calculations according to the number of the sheaves, though those of the beds certainly contained the most grain.

" Some of my neighbours, determined by the great superiority, which they had observed from the very first of my corn in the beds, beyond all the rest, resolved to practise the New Husbandry: but most of them were deterred by a notion of its being too expensive. This objection deserved serious attention. I therefore, to know how far it was really founded, calculated the expence of each kind of culture in a manner less subject to error than any former way of reckoning. I supposed all the work to be done by day-labourers; and I had thereby a sure means of comparison, by supposing, as I could easily do with certainty, the quantity of work which a plough or a man did in a day, and how much each of them earned.

" I made this calculation in 1758, and sent a copy of it to M. de Chateauvieux: but as I had forgot to notice there the charges of weeding and reaping, which are articles of considerable expence, I have inserted that omission in the following more careful computation.

" *Expence of the first Year's Culture of an Acre of Land, when it is first laid out in Beds.*

	l.	s.	d.
" To give an acre of ground that perfect tilth which M. de Chateauvieux describes, will cost, in this country, including the expence of weeding, performed by hand with hoes four inches wide (which will stir the ground pretty well) and all the charges of harvest, to the laying up of the corn winnowed and cleansed	2	3	3
" The culture which I intend to practise, and which consists in only the four first ploughings of the above article, with the same expences of weeding and harvesting, costs	1	12	8
" The culture which I gave to my land in 1756, consisting in one ploughing in broad lands, and a second to arch up the beds, with the expence of weeding and harvesting, as above, cost me - -	1	3	4
"Two ploughings in broad lands in 1757, with the same expences as before in other respects, cost me - - - -	1	8	7½

" *Annual Expence of cultivating an Acre of Land after the Beds are formed.*

	l.	s.	d.
" To bring an acre of land to perfect tilth, by giving it five ploughings, three of which are performed with the plough, and two with the cultivator in the alleys, and a sixth thorough ploughing of the whole ground immediately after harvest, will cost, with the same expences of sowing, weeding and harvesting, as before mentioned - -	1	2	7
" I have not yet given this general ploughing to the whole of any of my fields; but have hitherto restricted the sixth ploughing to the alleys only. This, with the same expences as before for all the rest, has cost me	1	0	0

" *Expence of cultivating an Acre of Land according to the Old Method.*

	l.	s.	d.
" It is proper to observe, that, in all the following calculations, I have charged the husbandman with only half the real cost of each kind of culture for each year, because the lands, being rested alternately, are cultivated only every other year. I give a peasant four acres of land to cultivate, and he ploughs two of them every year. The culture of these two acres cost him (at 2 l. 12 s. each) 5 l. 4 s. which is after the rate of 1 l. 6 s. a year for each of his four acres			
" The perfect culture of our peasants, who give the ground five stirrings by hand, the first with a kind of spade (with which they dig twelve or fourteen inches deep) and the four others, including that which serves to bury the seed, with a sort of hoe or mattock (which stirs the earth eight or ten inches deep) costs, with the usual expences of weeding, getting in the harvest, and cleansing the corn - - - -	1	6	3
" The culture of the peasants, which is now practised throughout the whole of my estate, consists in four stirrings of the earth, the first of which is performed with their spade, with which they are so idle as not to dig deeper than seven or eight inches: the second is given with a kind of hoe, which does not penetrate above five or six inches deep; the third with the common plough of this country, without wheels or mould-board, which even when drawn by the strongest mules, can never enter deeper than five or six inches; and the fourth, which serves to bury the seed, either with that plough or their hoe, which ever they like best. Their expences of weeding, reaping, &c. are the same as in the foregoing article, and it costs them in all for each acre of land - -	0	18	4
" Within these few years past, some more careful husbandmen give the first stirring with a plough with one wheel and a mould-board, drawn by six stout mules. This cuts seven or eight inches deep; and they perform the five other stirrings with their common plough. Their expences of weeding and harvesting are the same as those of the peasants, and each acre costs them	0	15	7
" Some give but two ploughings instead of five, with the common plough of this country. Their expences are the same in other respects, and the acre costs them	0	11	6

" The generality of our husbandmen do not yet use wheel-ploughs. The most diligent among them give six ploughings with the common plough of this country. Their

	l.	s.	d.
expences for weeding and getting in the harveſt are the ſame as above, and the acre ſtands them in - - -	0	13	5
"The ſlothful, who, unhappily, are the greateſt number, give their land only three ploughings with our common plough: but as they cannot avoid the expence of reaping and houſing their corn, each acre coſts them	0	9	2

"The charge of tillage is not near ſo great to thoſe who aſſiſt perſonally at the work, or even to thoſe who keep their own labourers and cattle. A minute examination of this point induces me to think, that it does not coſt the former above half, nor the latter above two thirds of the ſums mentioned in the foregoing accounts.

"From hence it follows, that every huſbandman will be repaid his diſburſements whenever his ſhare of the product, which is always equal to that of the landlord, is, for him who labours perſonally, one half, and for him who does every thing by his ſervants, two thirds of the above ſums; and that he will find a very conſiderable advantage in practiſing any method of which the product will repay his advancing money to day-labourers to do the work.

"A proof of this is, that the peaſants who tilled my lands were very well ſatisfied with their gain, though their expences amounted to eighteen ſhillings and fourpence, and like me, they cleared but thirteen ſhillings and ſixpence by each acre of ground.

"Where the land was ſowed in equally diſtant rows with the drill-plough, the expences were the ſame as in our common way; but the profit was greater.

"Though the expences of the New Huſbandry, where the land was laid out in beds, amounted to 1 l. 3 s. 4 d. an acre; yet it was more advantageous to the huſbandman, who cleared, as I did in quality of landlord, 1 l. 12 s. 6 d.

"We ſee, however, by theſe calculations, and the fact really is, that ſuch expence attends the laying of land out in beds, as may very often not be repaid the firſt year; but when the New Huſbandry is once eſtabliſhed, thoſe expences leſſen; and it appears that the cultivator will find his account in practiſing it, as much as the owner of the land.

Experiments *made in* 1758.

"My ſucceſs determined me to increaſe the number of my beds. I prepared, more carefully than the year before, a large piece of land, the ſoil of which was bad, and of which my farmers uſed always to ſow a part with rye or oats. Several peaſants adopted the method of ſowing in equally diſtant rows with the drill-plough. I ſowed my lands in the New Huſbandry in the month of September, and my other fields in October. The earth was ſtill gravelly, in poor tilth, and wanted moiſture. No rain fell during the months of September, October, and November. The corn roſe but indifferently even in the beſt prepared ſoils, and ſcarce a fourth part of it roſe in the common fields. It made very little progreſs before winter, and was not forwarder in the middle of January than it commonly is a fortnight after being ſown. We had, however, in December, and in the beginning of January, ſome ſlight rains, which, though they did not penetrate far into the earth, were ſufficient to make ſome of the corn that had not yet appeared, ſprout, and even to give the country a greeniſh hue. Froſts, which laſted from the 18th of January to the fourth of February, with ſuch ſeverity as is ſeldom known in this country, ſoon baniſhed this gleam of hope. They were accompanied with an impetuous north wind, which added greatly to the violence of the cold. I viſited my corn as ſoon as the weather began to grow a little mild, and found its blades abſolutely withered, though I ſtill diſcovered, with difficulty, a yet green part in the heart of ſome of the plants: but half of them were ſo totally deſtroyed, as not to retain the leaſt ſign of verdure. In ſome places, which were ſheltered from the wind, the blades were not at all withered, which made me think that the miſchief done to the reſt might proceed from ſome pernicious quality in the ſharp wind, rather than from the froſt.

"Though the plants were dead, they ſtuck faſt in the ground, and none of mine were either rooted up, or laid bare by the froſt. The great drought preſerved them from this accident, which would have totally ruined all the corn.

"The thaw was without rain, of which we had not any till the 14th of April, when it might have been of ſervice to the plants, but that ſnow (a phenomenon almoſt unknown here, even in the winter) fell on the 17th, and was followed by a hard froſt, which laſted two days, and not only prevented the good effects which we expected from the rain, but likewiſe did conſiderable hurt to all the productions of the earth, which, though they did not immediately appear to have been injured thereby, grew but poorly afterwards.

"My corn in the New Huſbandry, where the intervals between the beds had been hoed at the end of February throve well, and began to look promiſing: but within a few days after the froſt, I perceived marks of its being rickety, and this diſtemper ſoon made a rapid progreſs.

"The wheat in the common way, even in the beſt ſoils, was very thin, had not tillered, and was ſtill in nearly the ſame condition as at the end of the winter.

"The rain which fell on the 23d of April did not do any good, nor had we any more of it from that time till the 27th of May. The corn was then in a deplorable condition: the ears of that in the New Huſbandry were beginning to appear; the winter had not left a third part of the plants, and moſt of thoſe that did remain were ſtinted and quite rickety.

"The lands in the old way promiſed ſtill leſs. The plants there, beſides continuing to be very thin, were crooked and rickety, and ſeemed ſcarcely able to put forth their ears.

"Thirteen acres of extraordinary good land, the culture of which was not begun till after the froſt on the 19th of April, were the only ſpot that afforded ſome little hope. 'Till that froſt, the wheat in the beds was greatly ſuperior to any in this ground. Could the cauſe of this alteration proceed from the froſt's acting more powerfully upon, and conſequently doing greater injury to, the plants which were in full ſap, and whoſe ſhoots were yet tender, than on thoſe where the ſap was not yet in motion, and which had not yet begun to ſpindle? I thought ſo, and to me it ſeemed probable.

"Buſineſs obliged me to be abſent during the firſt fort'night in June, and I was greatly ſurpriſed at my return to find the corn, which had ſcarcely begun to ear when I left it, almoſt ready to ripen. Cold dews followed by great heats, and perfectly ſcorching weather which we had from the 6th to the 12th of June, joined to the dryneſs of the earth, occaſioned this ſudden change.

"A violent north-eaſt wind, which blew impetuouſly from the 18th to the 21ſt of June, completed our misfortunes, by ſhedding great part of the corn which bid faireſt to ſucceed. The loſs occaſioned by this accident was valued at one-third of the crop: nor could it well be leſs; for, after ſome ſhowers which fell in July, the whole field was covered with young plants, as thick as if they had been ſown upon the ſtubble.

"The crop was reaped between the 21ſt and 29th of June. It could not be a good one after ſuch adverſe events; nor was I, conſequently, ſurpriſed at finding the reſult of it different from that of the preceding year.

Product, in 1758, *of the Lands ſowed in the old Way.*

'I have kept a ſeparate account of one part of theſe lands, conſiſting in meadow ground newly broken up, and a field that was dunged all over in 1756, which never happened to any other, either wholly or in part. The peaſants charged with the culture of this part engaged to give me two hundred pounds of grain over and above the half of the product.

"*Product*

"*Produce, in* 1758 *of the very good Lands sown in the Old Way.*

I sowed - - - -	13 acres.
With - - -	2424 l. 6 oz.
Which produced - - -	10005 l.
Deducting the seed, there remained	7580 l. 10 oz.
Abating half of this for the year of fallow - - -	3790 l. 5 oz.
And also half of this remainder for the labourer's share, I had, as owner of the land - - -	1895 l. 2 oz.½
So that each acre yielded me -	145 l. 12 oz.½
Worth in money, at six shillings and three halfpence the quintal	8 s. 11 d.½

"The labourer, being obliged by our agreement to give me part of his half, had, in reality, but 46 l. which may be valued at 2 s. 9 d.

"*Produce, in* 1758, *of the ordinary Lands sown in the Old Way.*

I sowed - - -	25 acres.
With - - -	4316 l. 4 oz.
Which produced - -	8760 l.
Deducting the seed, there remained	4443 l. 12 oz.
Allowing half of this for the year of fallow	2221 l. 14 oz.
And half of the remainder for the labourer's share, I had, as landlord	1110 l. 15 oz.
Which makes for each acre -	44 l. 4 oz.½
Worth in money, at six shillings and three halfpence the quintal	2 s. 8 d.½

"I afterwards united these two calculations, in order to have the total product of my lands sown in the old way, and found it to be as follows.

"*Produce in* 1758, *of all the Land sown in the Old Way.*

I sowed - - - -	38 acres.
With - - -	6740 l. 10 oz.
Which produced - -	18765 l.
Deducting the seed, there remained	12024 l. 6 oz.
Allowing half for the year of fallow	6012 l. 3 oz.
And half of this for the labourer's share, I had, as landlord	3006 l. 1 oz.½
Being, for each acre - -	79 l. 2 oz.
Which in money, at six shillings and three halfpence the quintal, is equal to	4 s. 8 d.½

"*Produce in* 1758, *of the Lands sown in equally distant Rows with the Drill-plough.*

I sowed - - -	9 acres.
With - - -	916 l. 14 oz.
Which produced - -	3406 l. 14 oz.
Deducting the seed, there remained	2490 l.
Allowing one half of this for the year of fallow	1245 l.
And deducting again the labourer's half, there remained	622 l. 8 oz.
I received as landlord for each acre, in corn	69 l. 2 oz.
And in money, at six shillings and three halfpence the quintal	4 s. 3 d.

Note, I have included here the product of two thirds of an acre of meadow land newly broken up, which yielded seven times the seed.

"*Produce in* 1758, *of the Lands sown according to the New Husbandry.*

I sowed - - -	18 acres and ½
With - - -	703 l. 4 oz.
Which produced - -	2250 l.
There remained, after deducting the seed	1546 l. 12 oz.
And allowing half of this for the labourer, as the lands in this husbandry are never fallowed, there remained for the landlord	773 l. 6 oz.
Being for each acre in corn	41 l. 11 oz.½
And in money, at 7 s. 10 d.½ the quintal	3 s. 3 d.¼

"Our very unfavourable seasons could not but affect the crops; nor was it possible that any kind of culture should guard against the repeated accidents which befel my corn. The misfortune extended to all the neighbouring provinces, and wheat, which had not been at above nine shillings and two-pence farthing the quintal, for several years past, rose to thirteen shillings and three halfpence, and kept at this price during the whole year, notwithstanding that there was a great deal of old corn in all the granaries, and quantities arrived from other countries.

"This unseasonable weather was not only fatal to the corn, but likewise to all vegetation. Though the leaves of our mulberry trees did not seem to have been much hurt by the frosts in April, they were, however, so damaged, as to become pernicious to the silk-worms, which did not succeed any where. The winter killed all the clover in our fields; we had very little early crops of hay; not any spring corn, and scarcely half the usual quantity of wine and oil: even our saffron, which is a considerable article in this country, produced very few flowers: in short, the oldest man could hardly remember so bad a year. The New Husbandry did not fare better than the Old: it could not resist the rigour of the cold, which destroyed very many of the plants, and all the blades of the corn. The frosts in April were still more fatal by the rickety distemper which they occasioned; and the high winds in June did greater hurt to the wheat in the beds, where the grain was least shrivelled, than to that in the old way. It appeared from an estimate of a number of ears taken as they came, without culling them, that half the product of the beds was lost through this last accident.

"Notwithstanding all these misfortunes, when it is considered, that two thirds of my fields in the New Husbandry were my worst lands, and that the whole of them cannot be compared with those of the farm in general, and much less with lands of the very best quality, it will be found, that this method afforded a profit, though not such as to induce one to prefer it to all others.

"I had already prepared another field of about four acres, in order to lay this likewise out in beds, as in fact I did: but I resolved to wait the event of the year 1759, of which I am now to speak, before I proceeded farther in this method.

Experiments *made in* 1759.

"Rain, which we wanted before harvest, came after it, in such abundance, that all work in the field was suspended during the whole summer.

"Twelve acres of my land in beds suffered greatly by an inundation of the Oveze, a neighbouring river, which overflowed its banks on the 6th of July. The water drowned entirely all this ground, and washed away the summit of the beds in several places. The plough could not begin to work till September; and though the culture which I then gave formed new ridges, yet it could not pulverise the earth, or arch up the parts intended to be sown, which, in many places, were settled lower than the stubble.

"I sowed all my lands in the New Husbandry within the first fortnight in September, and those in the old way before the middle of October. The autumn was very rainy, and consequently favourable to the sprouting of the corn, which was however somewhat too thin in the part that had been overflowed. The plants in the beds were very fine in the beginning of December (at which time I was obliged to lose sight of them) excepting the field of about four acres, which was now sown for the first time in this way, but with two turns of the drill-plough, and in which the corn began to be rusted. I did not return to this farm till the middle of April.

"The winter had been very mild and wet. I found the corn in the beds very fine, and superior to all the rest, but too thin in the places which had been damaged by the flood. The field which began to be rusted in autumn, was now more so, and promised little; but, through the negligence of my servants, the alleys wanted stirring, and

and weeds choaked the corn in ſeveral places. I endeavoured to remedy this by good hoeings and careful weedings, which could not be performed in this advanced ſeaſon, without pulling up many of the plants of corn. Notwithſtanding all of my endeavours to correct the evil, I am perſuaded that this neglect coſt me a part of the crop I might otherwiſe have had.

"We had a good deal of rain on the firſt and ſecond of May; but a ſharp north-eaſt wind, which blew violently during the reſt of that month, hurt the corn greatly when it firſt began to ſpindle, and dried the earth at a time when we never find it too moiſt.

"Gentle rains and plentiful dews, which fell in the beginning of June, ſucceeded this ſtormy weather, and ſeemed to remedy the miſchief which the high winds had done.

"The wheat was cut between the 16th and 27th of June. Its ſtraw was ſhort, though long enough to bind up in ſheaves, which looked well. The grain was plump, and of a very good quality. The only complaint was of its being mixed with a great quantity of darnel.

"We had hopes of a plentiful harveſt. The price of wheat fell at once, towards the end of June, from thirteen ſhillings to ſeven ſhillings and ten-pence the quintal; but by the middle of July it roſe to twelve ſhillings and three-pence, and ſtill keeps at that price in the preſent month of January, 1760, notwithſtanding the immenſe quantities which arrive here daily from other countries.

"Our flattering hopes ſoon vaniſhed. The ſheaves yielded but very little grain, and the harveſt proved extremely bad, contrary to the expectation of every one. I endeavoured to trace the cauſe of this miſtaken opinion, and found it to be, that our huſbandmen had judged by the length of the ears, without conſidering that a great many huſks were ſo empty as not to have the appearance of corn in them. This accident ſeemed to me to have been occaſioned by the plants having loſt their bloſſoms, through the impetuoſity of the winds, which never ceaſed to blow with great violence during the whole time that the wheat was in bloom, and whilſt the grains ſhould have kerned.

"The corn in the New Huſbandry was equally affected by theſe adverſe events; but its ears were better filled with grain, than thoſe of the wheat raiſed in the old way.

"The people in theſe parts look upon this year as having given but half a crop: mine was tolerably good.

Produce, in 1759, of the Lands ſown in the old Way.

I ſowed - - - - - - - - - -	23 acres
With - - - - - - - - - -	3731 l. 4 oz.
Which produced - - - - - -	17202 l. 8 oz.
Remained, after deducting the ſeed -	13471 l. 4 oz.
Allowing half of this for the year of fallow	6735 l. 10 oz.
And half of the remainder for the labourer	3367 l. 13 oz.
I had, for each acre of land - - - -	146 l. 7 oz.
And in money, at ſix ſhillings and three-pence the quintal	9 s.

Produce, in 1759, of the Lands ſown in equally diſtant Rows with the Drill-Plough.

I ſowed - - - - - - - - - -	20 acres. ½
With - - - - - - - - - - -	2353 l. 2 oz.
Which produced - - - - - -	19221 l. 14 oz.
Deducting the ſeed, there remained -	16968 l. 12 oz.
Allowing half of this for the year of fallow	8484 l. 6 oz.
And half the remainder for the labourer's ſhare	4242 l. 3 oz.
I had, for each acre - - - - -	206 l. 15 oz.
And in money, at ſix ſhillings and three halfpence the quintal	12 s. 3½ d.

Produce, in 1759, of the Lands ſown according to the Principles of the New Huſbandry.

I ſowed - - - - - - - - - -	24 acres.
With - - - - - - - - - - -	1261 l. 14 oz.
Which produced - - - - - - -	12150 l.
Deducting the ſeed, there remained -	10888 l. 2 oz.
And only half of this for the labourer's ſhare, as theſe lands are not ever reſted, I had	5444 l. 1 oz.
Which is for each acre of land - -	227 l. 7 oz.
And in money, at 7s. 10½ d. the quintal	17 s. 9 d.

"I may, perhaps, be thought to favour the New Huſbandry in my eſtimate of its produce, in money: but I can aver that, this year, my land in beds, though part of it was deemed fit for rye only, produced nothing but very fine wheat, which ſold at market for twelve ſhillings and three-pence the quintal. My lands ſown in the old way, or in equally diſtant rows with the drill-plough, produced 4200 pounds of oats, 900 pounds of barley, and 800 pounds of rye. The ſiftings of my wheat raiſed in the Old Huſbandry amounted to a twelfth part of the crop; ſo great was the quantity of darnel mixed with it: a quarter part of the remainder ſold only at the price of rye, and the very fineſt part of it fetched no more than 10 s. 6 d. the quintal, at the very market where the wheat of my beds ſold for 12 s. 3 d. without having been ſifted.

"I have, however, deducted ten per cent. from the wheat of the New Huſbandry, though it ſold at the higheſt price, and have abated only thirty per cent. on that of my other lands, though an exact calculation proved to me that the loſs upon it amounted really to thirty-three per cent.

"The dearneſs of corn this year increaſed the price of all the productions of the earth to above one third more than before: a circumſtance which added conſiderably to the value of every advantage in huſbandry, as the expences attending this were ſtill the ſame.

"The reſult of theſe three years afforded a manifeſt evidence of the benefits which accrue from good tillage, and ſeems to prove plainly the ſuperiority of the drill-plough over the common method of ſowing, and that of the New Huſbandry over the Old.

"The harveſt in 1757 was but middling throughout this country, and good in my farm only. It was bad in 1758, becauſe nothing could poſſibly guard againſt ſuch adverſe weather as we then had. In 1759, no one in theſe parts had ſo good crops as mine were. Theſe ſucceſſes cannot be aſcribed to any other cauſe than the manner in which my lands have been cultivated.

"The diſtribution of my lands proves likewiſe evidently the advantage of ſowing in equally diſtant rows with the drill-plough. My peaſants ſpared no pains to render their reſpective portions equally fruitful. They cultivated them in the ſame manner, excepting only in the ſowing of the ſeed, where the drill-plough, ſowing in equally diſtant rows, always yielded a greater profit than the common way.

"The lands ſown in beds yielded ſtill more grain than thoſe ſown either in the old way, or in equally diſtant rows with the drill, in 1757 and 1759. This advantage cannot have been owing to any other cauſe, as I did not uſe dung any where; the culture there was not performed more carefully than in my other grounds; it coſt very little more than that of the peaſants; and a part of the fields in beds is known to be ſome of my worſt land, for which reaſon my farmers had always uſed it for rye.

"The year 1758 was ſo fatal to all the productions of the earth, that we ought rather to wonder at our having had a crop, than at its being very ſcanty.

"I may juſtly flatter myſelf that my ſucceſs will be ſtill greater in future years: my culture is improved by practice, my lands are brought into better tilth, my peaſants become accuſtomed to the new method, their repugnance to it leſſens, and I daily ſee faults of my committing, which now are leſſons to me.

"I was long perplexed about the proper time of ploughing in the ſtubble: but various trials induce me now to think, that this ſhould be done immediately after harveſt. It is what I ſhall practiſe for the future, and I recommend it to all who follow the New Huſbandry. It cannot be done after ſowing, becauſe ploughing then would bury the ſeed; and if it be performed only a little before ſeed time, the clods and ſtubble will neceſſarily obſtruct the operation of the drill-plough.

"My trials during theſe three years have convinced me, that the quantity of ſeed ſhould be diminiſhed in proportion to the goodneſs of the ſoil. The contrary cuſtom prevails in this country, becauſe, ſay our farmers, the richer the land is, the more plants it can nouriſh: but my experience during theſe three years has invariably proved to me that this is a vulgar error."

EXPERIMENTS *made near* Guignes, *in the Province of* Brie, *under the Direction of* M. Rouſſel, *and communicated to* M. Duhamel *in* 1755.

"M. Rouſſel prudently began, as we would advice every one to do, with ſmall experiments. His firſt trial of the New Huſbandry was upon a little ſpot: but being prevented from attending to it in perſon, many faults were committed during his abſence. On his return, which was towards the end of November 1754, he inquired after his crop, and learnt with pleaſure, that ſome grains had produced upwards of ſixty ears a-piece, and that many of theſe ears contained ſixty-four grains. This was ſufficientto ſhew him the excellenceof the new culture, which he immediately determined to extend to larger objects.

He had no time to loſe. Two contiguous pieces of ground, containing twenty-four acres, had been folded, and were juſt going to be ploughed for the laſt time, in order to be ſown according to the uſual practice of the country. Theſe were choſen for the farther trial of the New Huſbandry, and were accordingly ſown with the drill-plough, between the ninth and twenty-firſt of October, with 571 pounds of wheat, including ten pounds and an half, which were uſed to fill up ſome ſpaces where the ſeed had miſſed. This is after the rate of about twenty-four pounds to an acre.

At the ſame time, an adjacent piece of ground, which had been folded like the former, and of which the ſoil was equal to the beſt part of the field ſown in rows, was ſowed in the common way. This laſt contained four acres and a half, and took up, 486 pounds of ſeed, which is 108 pounds to an acre.

The corn came up finely in both fields: but that which was ſown in rows happened to be near a wood, from which numbers of rabbits came, and entirely deſtroyed the plants of near five acres: the roots which they left, were eaten up by worms: and the dung of the ſheep-folds produced a great quantity of weeds. This was not all: as the furrows did not run in the direction of the declivity of the ground, the water lodged in them, ſo that the firſt ploughing, which ought to have been given in March, could not be performed till April, when it left a great many clods.

Theſe clods were grown hard by the time of the ſecond ploughing, which was performed with a plough with two mould-boards, which inſtead of breaking and looſening the ground, and laying freſh earth to the roots, only turned thoſe hard clods over upon the rows.

The third ploughing, which was given with a plough with two ſhares, and in more favourable weather, had a better effect.

Notwithſtanding the accidents which had reduced this piece of wheat to ſo wretched a condition, that the huſbandmen ſaid they were ſure it never would produce a crop worth reaping, and that all the labour beſtowed upon it was thrown away; yet, reckoning upon the ſame footing of twenty-four acres, though it would be but juſt to deduct the five which were abſolutely deſtroyed by the rabbits; and ſuppoſing too the crops of 1756 and 1757 to be no greater than that of 1755; M. Rouſſel's calculation proves, that even theſe three crops will ſtill be better than what the ſame field would produce in the common way.

But, ſays M. Rouſſel, if we do the New Huſbandry part of the juſtice it deſerves; and inſtead of including the five acres which the rabbits deſtroyed, we reckon only the produce of nineteen acres prepared in a hurry, and badly ploughed; and even ſuppoſe them to be no better managed in the following years, and the whole extent of the 24 acres, to be only of the ſame quality as the four acres and a half with which it was intended to be compared; the produce of both, in three years, will be as follows.

The nineteen acres produced 11592 pounds of wheat, which was preferred to any other for ſeed, not only becauſe it was finer, but likewiſe becauſe it was quite free from all ſeeds of weeds. This is after the rate of 610 pounds for every acre.

From this, we are to deduct the ſeed, which is, for each acre, twenty-four pounds.

The neat produce of each acre will then be 586 pounds of wheat, free from all ſeeds of weeds.

Suppoſing the crops to be no greater in the following years, though what we ſhall ſay hereafter will ſhew that they certainly will, each acre will have produced neat at the end of three years, 1758 pounds of wheat.

The other piece of ground, which was cultivated in the old way, in order to make the compariſon, produced 1260 pounds an acre, from which we are to deduct 154 pounds for the feed.

The remaining neat produce is 1106 pounds.

The ſecond year's produce of this ſame acre, ſowed with ſpring corn, can be reckoned at only half the value of the firſt year's crop of wheat; and the third year produces nothing, being the year of fallow.

Thus the total neat produce of the acre cultivated in the common way will be, at the end of three years, only 1659 pounds; whilſt that in the new way, will be 1758 pounds.

M. Rouſſel *gives the following Account of his Experiments in* 1756, *in a Letter to* M. Duhamel.

"In October 1755, I choſe, in the middle of a fallow field which had been well ploughed, and was not expoſed to any of the accidents I met with laſt year, a piece of ground, which, to make a fair compariſon between the new method and the old, I divided into two equal parts, each containing twelve acres. One of theſe ſpots was ſet apart for the New Huſbandry; and the other, exactly of the ſame quality, and quite contiguous, to be ſowed broad-caſt in the old way.

"This laſt ground had been extremely well dunged by the folding of the ſheep. With regard to the other, which was to be cultivated in the new way, and which compoſed ninety-three beds five feet wide, including the alleys; only eight of theſe beds were dunged by ſheep, and that at the ſame time, and to the ſame degree as the ground by which the compariſon was intended to be made: of the other beds, ſeventy-ſix had no ſort of dung or amendment whatever: and nine were dunged more or leſs, in the manner and proportion hereafter mentioned.

"Moſt of thoſe who practiſe the New Huſbandry uſe no dung at all. I ſuppoſed that their reaſon for rejecting this manure was, the difficulty of finding a proper time to apply it; for whilſt the alleys receive their ſeveral ſtirrings, no wheel-carriage can be admitted with dung without hurting the beds which are ſown, and hardening the looſe mould of the alleys: to carry it on the backs of cattle, would be at beſt a very difficult, tedious, and expenſive way, where any conſiderable ſpace is to be dunged: to ſpread it upon the earth only the moment the ſeed is ſown, is a ſure way to clog up the drill-plough, and hinder its operation, if the dung be not thoroughly rotten; and to breed weeds, which by no means ſuit this culture. To remedy theſe inconveniencies, I contrived the following method. I opened in each of the alleys one of thoſe large furrows which muſt always be every year at the concluding of the ſummer hoeings, in the place where the three rows of ſeed are afterwards to be ſown; and by drawing the plough with two mould-boards once through it, I made it fourteen or fifteen inches wide; which is the breadth that the three rows of ſeed require. The ſpace between two of theſe deep furrows, is exactly the breadth of a cart, the wheels of which going in them, hurt no part that has been ploughed, and do not preſs down or harden the looſe mould; nor do the horſes do any damage, becauſe they neceſſarily tread upon the ſtubble of the late reaped beds, in the middle between theſe two furrows. This was the method I uſed to dung the nine beds, in queſtion. The dung was well rotted: it was ſpread at the bottom of the furrows, and immediately covered over by the fame ploughing that made the beds which were fown fome days after. Perhaps this manure may be of more fervice to my lands than to many others, becaufe the foil is naturally cold and backward. The grain is by this means fown upon a kind of gentle hot-bed, the warmth of which promotes the branching and vegetation of the plants. The winter rains and frofts, raife a fermentation. The firft fpring ploughing, by giving it a little air, revives that fermentation at the very time when the fap is moft active, and the plant begins to branch. As the dung rots, a kind of motion is caufed in the earth, which in fome meafure anfwers the end of a flight ploughing, and brings frefh nourifhment to the roots. The fame heat as confumes the ftraw, likewife confumes the little feeds that are in the dung, which might otherwife produce numbers of weeds. When this dung is brought up again to the furface of the earth, by the next year's ploughings, it will no longer have thofe hurtful feeds. It will indeed have loft its heat; but it will ftill have retained all its fatnefs, which will mix with the earth; and land thus conftantly dunged, will in time become a perfectly fine mould. But if thefe layers of dung fhould be fpread too thick, or the dung itfelf be of too hot a nature, the roots of the corn might perhaps be endangered thereby. It was to determine this, that I tried the following experiments, to know the effects of different dungs, and what quantity it is proper to employ.

"Three beds were dunged, in the above manner, with horfe-dung: the firft, which was 1165 feet long, had three loads of dung; the fecond, of 1171 feet, had but two and a half; and the third, 1183 feet, had but two. Three other beds were dunged with cow-dung: one of 868 feet, with two loads and a half; and the fecond of the fame length, with two loads; and the third, of 874 feet, with only one load and a half. The three remaining beds had fheep's dung: the firft, of 842 feet, two loads; the fecond, of 838 feet, one load and a half; and the third, which was of the fame length, one load.

"Thefe beds were diftributed in fuch manner, that each of them was in the middle of two other beds which were not dunged. The field, thus laid out, was fown on the thirteenth, fourteenth, fifteenth, and fixteenth of October, with the drill-plough, which plants three rows in each bed. I ufed 378 pounds of feed; and afterwards ten pounds to fill up the chafms; which is after the rate of thirty-two pounds fix ounces to an acre, and confequently a little too much. Accordingly, when the corn came up, I faw it was too thick fown. The reafon was, that the grain was too fmall, in proportion to the outlets of the drill-plough. At the end of ten days, this corn rofe well. On the eighteenth of December, I obferved that moft of thefe plants had branched into four ftalks, whilft thofe in the common way had but three. I perceived no fenfible difference then, between the dunged and the undunged beds. It was not till the twenty-fourth of January that I faw plainly that the plants of the dunged beds were of a deeper green, and had made longer and more vigorous fhoots than thofe of the undunged beds. By the twentieth of February, five fmaller ftalks iffued out of the five great ones, which was not the cafe with the wheat in the common way. The alleys did not receive their firft ploughing till the 10th of March. Eleven of the main ftalks grew an inch and an half in five days; and I obferved that the moles were rather more bufy in the dunged beds, than in the others. As the earth was yet fomewhat too foft, I thought it needlefs to continue a ploughing which could not do any good, and therefore poftponed it to the twenty-eighth of March, and following days. On the ninth of April, I found a plant with eighteen ftalks in one of the dunged beds: the greateft number of branches that any of the plants in the undunged beds had, was twelve: but, on the other hand, I likewife found fome which had eighteen in the field of comparifon fown in the common way.

"On the ninth of May, this fame plant had twenty ftalks; and from that time it branched no more. The fecond ploughing was not given till three weeks after, viz. the twenty-eighth of May; which, I think, was fomewhat too late after the corn had ceafed to branch. By the twenty-third of June, there were three forts of wheat in all the beds: there were ears in bloffom, others juft going out of bloom, and others not yet out of their hoods. The fineft ears were thofe which came up and bloffomed firft. The moft forward beds were thofe which had been dunged under furrow with fheep's dung: the next to them were the eight beds which had been folded, the plants of which were a little greener than thofe of the undunged beds. The laft ploughing was given on the tenth of July. The grain had then begun to fill: but that in the common way was the moft forward, though it was fowed three weeks later than the other. I know not for what reafon, the wheat of the New Hufbandry began to be reaped on the fourth of Auguft, and that in the old way was let ftand till the thirteenth. The produce of both cultures was as follows.

In the twelve Acres cultivated in the new Way, the three Beds dunged with Horfe-Dung, yielded,

	Sheaves.
The firft, 1165 feet long, dunged with three loads	19
The fellow to it, not dunged, - - - - - -	15
The fecond, 1171 feet long, dunged with two loads and a half	18
The fellow to it, not dunged, - - - - - -	14
The third, 1183 feet long, dunged with two loads	16
The fellow to it, not dunged, - - - - - -	13

The three Beds dunged with Cow-Dung, yielded,

The firft, 868 feet long, and dunged with two loads and a half	16
The fellow to it, not dunged, - - - - - -	11
The fecond, likewife 868 feet long, and dunged with two loads	15
The fellow to it, not dunged, - - - - - -	12
The third, 874 feet long, and dunged with one load and a half	14
The fellow to it, not dunged, - - - - - -	12

The three Beds dunged with Sheep's Dung, yielded,

The firft, 842 feet long, and dunged with two loads	17
The fellow to it, not dunged - - - - - -	10
The fecond, 838 feet long, and dunged with one load and a half,	15
The fellow to it, not dunged - - - - - -	11
The third, alfo 838 feet long, and dunged with one load,	14
The fellow to it, not dunged, - - - - - -	10

The eight Beds which had been folded, two of which were

1171 feet long, three 1177 feet, and three 1183, produced in all,	142
This is near 18 fheaves a-piece.	
The 67 other beds, which had not been dunged, produced in all	814
This is fomewhat more than 12 fheaves a-piece.	
Total produce of the 12 acres cultivated in the new way,	1208
The 12 acres fown in the common broad-caft way, after having been well folded all over, produced	1820

"Thefe facts fhew the advantage of dunging in this manner. It is plain that the beft dung is that of fheep, and that it is more profitable when laid under furrow, than when it is fpread upon the furface of the ground by folding.

"In proportion to the produce of the bed 842 feet long, which was dunged with two loads of fheep's dung, and produced feventeen fheaves; the bed 1165 feet long, which was dunged with three loads of horfe-dung, and produced only nineteen fheaves, would, if dunged with fheep's dung, have produced $23 + \frac{52}{100}$; and the bed dunged with cow-dung, which yielded but fixteen fheaves, would have yielded $17 + \frac{52}{100}$.

"The eight folded beds, whofe whole length was 9412 feet, would have yielded 190 fheaves $+ \frac{3}{100}$, inftead of only

only 142 sheaves, which was the amount of their product.

"It is likewise plain, that if the whole of my twelve acres in the new way had been dunged with sheep's dung, as the bed 242 feet long was; I should, in the same proportion, have reaped 1700 sheaves, which would be but 120 sheaves less than the whole produce of the twelve acres folded all over, and sown in the broad-cast way. But even then, I say, that those 120 sheaves would not be equivalent to the quantity of grain which I saved by sowing according to the New Husbandry. An hundred of our sheaves yielded, in general, little more than 378 pounds of wheat. The 120 sheaves which the twelve acres sown in the broad-cast way produced more than the twelve acres in beds, would therefore yield but 453 pounds. Deduct this from 871 pounds, which I saved in the seed of these last twelve acres sown in the new way, and I shall still be a gainer: for I sowed only 388 pounds in this ground; whereas 1260 pounds were used to sow the other twelve acres in the common way. This would have been the produce of this first year's crop, supposing that the whole of my twelve acres in beds had been dunged in the same manner as the bed 843 feet long. For want of that, I reaped but 1208 sheaves. They have just been threshed, and have yielded only 5040 pounds of grain."

M. Duhamel makes the following remarks on this account of M. Roussel.

"The 1208 sheaves yielded but 5040 pounds of grain; from which we are to deduct 388 pounds for the seed. The neat produce is therefore 4652 pounds, which would make in three years 13956 pounds. The other field in the common way produced 8757 pounds; from which we are to deduct 1260 pounds for the seed: the neat produce is consequently 7497 pounds; the half of which is 3748 pounds and a half, for the value of the next year's crop. This is all that the twelve acres in the common way would produce in three years, and amounts to no more than 11245 pounds and a half: consequently the balance in favour of the New Husbandry in three years, is 2710 pounds and a half, or one fourth part of the whole: and that from a field which was sown in rows for the first time, and of which three fourths were not dunged at all: whilst the other, with which it is compared, had been folded all over, and for the year, produced a very plentiful crop."

Extract of a Letter from a Gentleman in Poitou.

"Being convinced of the advantages of the new method of cultivating land, I resolved to make a trial of it, by comparing the produce of a field cultivated in the common way, with that of another field cultivated according to the New Husbandry: and as M. Duhamel has desired all lovers of agriculture to try by experiments made with care, whether it be most profitable to sow beds with two, or with three rows of corn; or, which is the same thing, to find at what distance the rows ought to be sown; I divided a spot of ground into ten equal parts, which I made into as many beds, each six feet wide.

"In the middle of five of these beds I sowed three rows, seven inches asunder; so that they took up fourteen inches of ground, and there remained four feet ten inches for the breadth of the alleys, which is very sufficient for the horse-hoeing husbandry.

"I sowed three other beds with only two rows, a foot distant from each other; consequently the alleys were five feet wide.

"The two remaining beds were sown with two rows each, three feet asunder. The alleys were therefore but three feet wide: or rather the whole of this last spot may be looked upon as sown in single rows, with alleys three feet wide, which is too narrow a space to admit of horse-hoeing them conveniently.

"Before I speak of the produce of these beds, it will be proper to observe:

"1. That this trial was made with rye. My fear that birds might eat up the wheat, made me prefer rye, which I advise every one to do, when only small experiments are made. This escaped without the least damage; whereas I have observed, that when experiments have been made with wheat, the birds, preferring that to any other grain, have always destroyed a considerable part of the crop.

"2. The beds sown with three rows were near a hedge, which greatly damaged two of them, either by its roots exhausting the ground, or by its shadow keeping that part harder frozen than the rest.

"3. The intervals were not hoed at all, between either the double or the triple rows; only the alleys were horse-hoed; and consequently none but the single rows were hoed on both sides.

"4. On the 25th of February, the alleys were ploughed. I visited them on the second of March, and found, upon examining the plants, that, in these five days, they had shot out roots four inches long into the new stirred mould. I repeated the hoeings at proper times, and the rye continued in good condition till it was reaped. The last hoeing was given after the blossoming was past.

"5. I then examined the roots, and found they had extended eighteen inches into the loose mould. This may seem strange; but I am certain it is true; for I took every precaution not to be deceived.

"6. The alleys between the single rows were hoed but twice, being too narrow to admit the plough after the plants had begun to branch. However, I had not reason to complain of the produce of these single rows.

"Having now given an account of my operations, it is time to speak of the products.

"The ears in my rows were from four to seven inches long, and the stalks from four to six feet high, which was one third taller than in the neighbouring fields cultivated in the old way.

"This spot of ground, in the best years, never produced more than five bushels, including the bushel of seed corn; for that was the quantity generally used: in common years, it has not yielded above four bushels, and frequently much less. We therefore cannot reckon its produce, one year with another, at more than four bushels, including all faulty grains and seeds of weeds, which fall through the sieve, and remain mixed with the good grain. This year it has yielded me seven bushels of fine clean rye, considerably larger than the common sort. I make no account of the seed, the quantity was so small. To prevent this grain's being mixed with any other, and at the same time to judge more exactly of the produce of my ground, I had the sheaves threshed out close by the field; but it was in the middle of a road, where all the grains scattered by the flail could not be gathered up; by which I reckon I lost more than the amount of the seed that was sown in the rows. The produce of my little field was therefore this year, compared to other years, as seven is to four; to which must be added, that it is capable of bearing as great a crop every year, which is not the case in the common husbandry.

"Let us now examine the produce of the rows, and compare them with one another, in order to judge whether it be most profitable to sow in single, double, or triple rows.

"Two beds, the most distant from the hedge, sown with triple rows, yielded each three quarters of a bushel.

"Two beds with double rows, yielded each two thirds of a bushel; consequetnly the three beds with double rows yielded two bushels, and the six rows sown two and two, in three beds, yielded one quarter more than the six rows sown three and three in two beds; but two beds of three rows a-piece yielded one ninth more than two beds of only two rows a-piece; whence we may conclude, that the distance of the rows increases the produce of an equal number of plants; or, which comes to the same, that an equal quantity of seed will produce more grain when the rows are more distant, than when they are sown closer together. But this is not a real profit; because the six double rows take up one third more ground than the six triple rows.

"Each of the single rows yielded seven-eighths of a bushel, which is one seventh more than the triple rows, though they took up no more ground; and their produce would probably have been greater, if they had been hoed two or three times more.

"It appears by this account, that the profit would probably have been on the side of the double rows, if the alleys had been made only four feet wide, instead of five; for by this means I should have gained one fifth more ground; and four feet are a sufficient breadth for the operations

rations of the horse-hoe. Where the single rows are so near as in this experiment, the same ground would scarcely bear another crop the next year, for want of having been sufficiently stirred. To clear up this point by a new experiment, I have sown single rows in the middle of four beds, two of which are four feet wide, and the two others only three. The winter hoeings have been given them with ease, and I hope the others will not be more difficult, at least till all the corn is spindled. What I fear most is, the earth's being carried off the narrow space on which the rows stand, when a thaw comes on, or by the heavy rains which are frequent with us.

"The rest of my field is sowed in two rows, in beds four feet two inches wide. I have done this, because, as it is the general custom here to make our ridges about that breadth, I am in hopes that if I obtain a plentiful crop, I shall be able the more easily to prevail on the farmers of this country to adopt a method, the advantage of which I am sensible of, before I tried the above experiment."

As it will be doubtless expected by our readers, that the advantages resulting from both the Old and New Husandry, should be set in the clearest and most conspicuous point of light under this article; we shall add here two calculations, that lately appeared in the Museum Rusticum, and appear to be made with great accuracy and candor.

The Profit attending Arable and Pasture Land compared, as found by Experience, near Bury, in Suffolk.

The following calculation of the different profit attending arable and pasture land in my neighbourhood, is drawn up not merely from fancy, but from the exact accounts I have kept of my own crops, and the information I have gained from several sensible farmers.

I take twenty acres, and suppose them an addition to a farm; but I should premise such an one as will require some additional cattle to be kept for it, perhaps two horses; but a farm of fifty pounds per annum may be so circumstanced as to require no material standing expences extraordinary for such an addition, in which case the ploughings, &c. will not cost near what I have laid them at; but the fairest way is the supposition I have made. We reckon nothing is either got or lost by four shillings per acre for a clean earth.

Calculation of the Expences and Profit of farming a ploughed or pasture Field of twenty Acres for nine Years, on a Supposition, that it is not a Farm by itself, but an Addition to another of fifty Pounds per Annum, the Soil wet, and a loose Woodcock, Brick Earth, on the Surface, for eighteen Inches deep, and under that a very good stiff Clay, improved by Land-draining.

First Year, Fallow.

	l.	s.	d.
Rent charges	15	0	0
First ploughing, a clean earth	4	0	0
Second ditto, ribbling it close overwart	4	0	0
Harrowing it overwart	0	5	0
Rolling	0	3	0
Third ploughing, a roving	2	10	0
Fourth ditto, a clean earth	4	0	0
	29	18	0

Second Year, Barley.

	l.	s.	d.
Rent, &c.	15	0	0
First ploughing, a clean earth	4	0	0
Harrowing down the ridges	0	5	0
Expences of mucking, at twenty loads per acre, and spreading the muck, supposed to be at the farmer's house	10	0	0
Second ploughing, the sowing earth, as it may be done with a double-breasted plough, to shut up the barks; that and the harrowing	4	0	0
Seventeen comb and two bushels of seed-barley, at eight shillings and six-pence per coomb	7	8	9
	40	13	9
Brought over	40	13	9
Two bushels and a half of clover-seed, at twenty five shillings per bushel	3	2	6
Harrowing and water-furrowing	0	10	0
Weeding	1	0	0
Harvesting, two shillings and six-pence per acre	2	10	0
Threshing one hundred and sixty coombs, at six-pence per coomb	4	0	0
Carrying out one hundred and sixty coomb at eight times, eight pounds; but as back carriage may sometimes be got, say	5	0	0
Expences eight times at market	1	10	0
	58	6	3

Third Year, Clover.

	l.	s.	d.
Rent, &c.	15	0	0
Cutting twenty acres, and harvesting it	3	0	0
Threshing thirty-two bushels of clover-seed, at four shillings per bushel	6	8	0
Expences of carrying the seed out, and at market	1	15	0
Weeding the clover	0	10	0
	26	13	0

Fourth Year, Wheat.

	l.	s.	d.
Rent, &c.	15	0	0
Ploughing, harrowing, and water-furrowing the clover-land, and sowing the wheat, five shillings and six-pence per acre	5	10	0
Ten coomb of seed	8	0	0
Weeding	1	10	0
Harvesting, including all expences, five shillings per acre	5	0	0
Threshing one hundred coomb	5	0	0
Carrying out ditto, at five goings, back carriage three of them, and at market	3	0	0
Haulming, at one shilling and six-pence	1	10	0
	44	10	0

Fifth Year, Fallow.

	l.	s.	d.
Rent, &c.	15	0	0
Expences the same as the first year	14	18	0
	29	18	0

Sixth Year, Wheat.

	l.	s.	d.
Rent, &c.	15	0	0
Mucking, the materials supposed to be in the farmer's yard	10	0	0
Ten coomb of seed blew-chaff wheat	7	0	0
Sowing earth	4	0	0
Weeding	2	0	0
Harvesting	5	0	0
Threshing one hundred and twenty coomb, at one shilling and two pence per coomb	7	0	0
Carrying out ditto, at six times, as before	5	0	0
	45	0	0

Seventh Year, White Oats.

	l.	s.	d.
Rent, &c.	15	0	0
First ploughing, a clean earth	4	0	0
Water-furrowing	0	5	0
Second ploughing, a clean earth	4	0	0
Water-furrowing	0	3	0
Third ploughing, sowing earth, and harrowing	5	0	0
Twenty coomb of seed	8	0	0
Weeding	0	10	0
Harvesting, two shillings and six-pence per acre	2	10	0
Threshing one hundred and twenty coomb	3	0	0
Carrying out six times, and marketing	3	18	0
	46	6	0

Eighth

Eighth Year, Tares and Turneps.	l.	s.	d.
Rent, &c. - - -	15	0	0
One clean earth, and harrowing ten acres for tares, and water-furrowing, and rolling	2	10	0
Five coomb of feed-tares - -	2	10	0
Cutting, making, loading, and ftacking of fifteen loads of tare fodder - -	2	0	0
Ploughing up the tare land, a clean earth	2	0	0
Overwarting another clean earth - -	2	0	0
Roving it - - -	1	5	0
Firft ploughing for turneps, ten acres, a clean earth - - - -	2	0	0
Second ploughing, drawing the ridges into barks - - - -	1	0	0
Third ploughing, ribbling it overwart	1	10	0
Harrowing it flat - - -	0	2	6
Fourth ploughing, a clean earth; draw it on to the fteach - - -	2	0	0
Fifth ploughing, fowing earth, up-fet it, and harrowing - - -	2	5	0
Turnep feed - - -	0	5	0
Firft hoeing, at four fhillings per acre	2	0	0
Second ditto, at two fhillings and fix-pence	1	5	0
	39	12	6

Ninth Year, Wheat and Barley.			
Rent, &c. - - -	15	0	0
Ploughing and fowing the tare land with wheat, water-furrowing, &c. -	2	10	0
Five coomb of feed red-ftalked wheat -	4	0	0
Weeding - - - -	0	15	0
Harvefting - - - -	2	10	0
Haulming - - - -	0	15	0
Threfhing fixty coomb - -	3	0	0
Carrying out ditto, &c. - -	2	10	0
Ploughing and fowing the turnep land with barley, harrowing, rolling, and water-furrowing - - -	2	10	0
Eight coomb of feed patney barley	3	4	0
Weeding - - - -	0	2	6
Harvefting - - - -	1	5	0
Threfhing feventy coomb - -	1	15	0
Carrying out feventy coomb -	1	10	0
	41	6	6

P R O D U C E.

First Year.			
Sheep-feed worth - -	1	10	0

Second Year.			
One hundred and fixty coomb of barley, at eight fhillings per coomb - -	64	0	0
Shack for cattle - - - -	2	0	0
	66	0	0

Third Year.			
Feed of clover before it is feeded -	20	0	0
Thirty-two bufhels of clover-feed, at one pound five fhillings per bufhel -	40	0	0
Feed after feed - - - -	2	0	0
	62	0	0

Fourth Year.			
One hundred coomb of wheat, at fifteen fhillings per coomb - - - - -	75	0	0
Shack for cattle - - - -	1	10	0
	76	10	0

Fifth Year.			
Sheep-feed - - - - -	1	10	0

Sixth Year.			
One hundred and twenty coomb of wheat, at fourteen fhillings per coomb - -	84	0	0
Shack for cattle - - - -	1	10	0
	85	10	0

Seventh Year.			
One hundred and twenty coomb of white oats, at eight fhillings per coomb - -	48	0	0
Shack for cattle - - - -	2	0	0
	50	0	0

Eighth Year.	l.	s.	d.
Fifteen load of tares - - - - - - - -	15	0	0
Ten acres of turneps to buy cattle in, and fatten on them, to fell off in the fpring, worth three pounds per acre - - - - - - -	30	0	0
	45	0	0

Ninth Year.			
Sixty coomb of wheat, at fourteen fhillings and fixpence per coomb - - - - -	87	0	0
Shack - - - - - - - - - - - -	0	15	0
Seventy coomb of barley, at feven fhillings and fixpence per coomb - - - - -	26	5	0
Shack - - - - - - - - - - - -	1	0	0
	115	0	0

Firft Year.	l.	s.	d.	Sixth Year.	l.	s.	d.
Expences -	29	18	0	Produce - -	85	10	0
Produce - -	1	10	0	Expences - -	45	0	0
Lofs - - -	28	8	0	Profit - - -	40	10	0
Second Year.				**Seventh Year.**			
Produce -	66	0	0	Produce - -	50	0	0
Expences -	58	6	3	Expences - -	46	6	0
Profit - -	7	13	9	Profit - - -	3	14	0
Third Year.				**Eighth Year.**			
Produce - -	62	0	0	Produce - -	45	0	0
Expences - -	26	13	0	Expences - -	39	14	6
Profit - - -	35	7	0	Profit - - -	5	7	6
Fourth Year.				**Ninth Year.**			
Produce - -	76	10	0	Produce - -	115	0	0
Expences - -	44	10	0	Expences - -	41	6	6
Profit - - -	32	0	0	Profit - - -	73	13	6
Fifth Year.							
Expences - -	29	18	0				
Produce - -	1	10	0				
Lofs - - -	28	8	0				

Profit.	l.	s.	d.	Lofs.	l.	s.	d.
2d Year - -	7	13	9	1ft Year - -	28	8	0
3d Year - -	35	7	0	5th Year - -	28	8	0
4th Year - -	32	0	0				
6th Year - -	40	10	0	Lofs of 2 years	56	16	0
7th Year - -	3	14	0				
8th Year - -	5	7	6				
9th Year - -	73	13	6				
Profit of 7 years	198	5	9				
	56	16	0				
	141	9	9	Total profit in nine years;			

Which is fifteen pounds fourteen fhillings and eightpence per annum, or rather better than fifteen fhillings per acre.

But I fhould obferve, that as a crop of clover-feed is the moft uncertain and various of any that is grown, I have reckoned lefs for it by far than multitudes produce, though, at the fame time, many bring nothing at all.

I know a field of twenty acres, which I have been often told by feveral who knew the crop, once produced the farmer five bufhels per acre. It was all down on a Friday, and the farmer fufpecting a change of weather, by great rewards to his workmen, and bringing cafks of ale into the field, and feeding them well, tempted them to work in an extraordinary manner all the Saturday, and cleared the whole into barn. It began raining in the night, and fo much fucceeding bad weather came, that the crops were, in general, greatly damaged. His produced, as I faid, one hundred bufhels, all which he fold at three pounds ten fhillings per bufhel, arifing to three hundred and fifty pounds. And a few years ago I faw the fame field with a crop of clover, which did not produce twenty pecks, and that fo wretched as to fetch nothing.

I read this calculation to a farmer, and he obferved, that I fhould reckon eighty bufhels for the crop; and as it is often grown, I will give you another total, with that alteration, that your readers may adopt either, according to their idea of the chance.

	l.	s.	d.
Profit - - -	248	13	9
Lofs - - -	56	16	0
	191	17	9

which is twenty-one pounds fix fhillings and five-pence per annum, or better than a guinea per acre.

As I mention back-carriage in this calculation, I will explain my meaning. We generally carry our corn to Ipfwich, Manningtree, or Thetford, from which places we load home with coals for blackfmiths, or any perfons that want them, who pay us eighteen fhillings for the carriage of a loading, twelve fhillings per chaldron, and we generally bring one and a half. But as we may accidentally carry our corn where none is to be had, I make fuch allowance as to bring it near the truth.

Calculation of nine Years Expences and Profit of twenty Acres of Grafs-Land, the Soil fuppofed to be the fame as the above Arable-Land, with no other Difference than being Grafs or Ploughed.

First Year's Expences.	l.	s.	d.
Rent, &c. - - - - - - - - - -	15	0	0
Mowing, making and cocking ten acres of grafs to hay at three fhillings per acre with beer - - - - - - - - - -	1	10	0
Stacking, loading, &c. of ten loads of hay -	1	10	0
Expences on four goings of hay when it is fold, weighing, and market - - - -	0	16	0
N. B. Nothing is reckoned for carriage as manure is brought back.			
Fifteen old crones, bought in Auguft - -	3	15	0
Expences in buying fheep - - - - -	0	4	0
Three cows at five pounds each - - - -	15	0	0
A fow, and ten pigs three weeks old - -	2	12	6
Suppofing two acres to be manured each year with twenty-fix loads per acre.			
Forty loads of clay, at two-pence halfpenny per load - - - - - - - - - - -	0	8	4
Twelve ditto of afhes, mortar, or rotten dung, brought from Bury; fix waggon loads, at eleven fhillings and fixpence per load - - - - - - - - - - - -	3	9	0
Expences of carrying it on, and fpreading, &c.	1	8	0
Turning and mixing manure - - - - -	0	4	0
	45	16	10

Second Year.	l.	s.	d.
Rent, &c. - - - - - - - - - - -	15	0	0
Mowing, making, &c. of fix acres of grafs	0	18	0
Stacking, &c. fix loads of hay - - - -	0	18	0
Weighing, marketing, &c. - - - - -	0	10	0
Expences of buying fheep - - - - -	0	1	6
A fcore of old crones - - - - - - -	6	0	0
Manuring two acres as above - - - -	5	9	4
	28	16	10

Third Year.	l.	s.	d.
Rent, &c. - - - - - - - - - - -	15	0	0
Mowing and making, &c. eight acres of grafs at three fhillings per acre - - -	1	4	0
Stacking, &c. - - - - - - - - - -	1	4	0
Weighing and marketing, &c. - - - -	0	12	0
Expences on cattle - - - - - - - -	0	2	0
Fifteen crones - - - - - - - - - -	3	15	0
Manuring two acres as above - - - -	5	9	4
	27	6	4

Fourth Year.	l.	s.	d.
Rent, &c. - - - - - - - - - - -	15	0	0
Mowing and making twelve acres, at three fhillings per acre - - - - - - - -	1	16	0
Stacking, &c. - - - - - - - - - -	1	16	0
Weighing and marketing - - - - - -	0	18	0
Expences on cattle - - - - - - - -	0	5	0
Fifteen crones - - - - - - - - - -	4	0	0
Manuring two acres as above - - - -	5	9	4
	29	4	4

Fifth Year.	l.	s.	d.
Rent, &c. - - - - - - - - - - -	15	0	0
Mowing and making ten acres - - - -	1	10	0
Stacking, &c. - - - - - - - - -	1	10	0
Weighing and marketing - - - - - -	0	16	0
Expences on cattle - - - - - - - -	0	3	0
Fifteen crones - - - - - - - - - -	3	7	6
Manuring two acres as above - - - -	5	9	4
	27	15	10

Sixth Year.	l.	s.	d.
Rent, &c. - - - - - - - - - - -	15	0	0
Mowing and making nine acres - - - -	1	7	0
Stacking, &c. - - - - - - - - - -	1	7	0
Weighing, &c. - - - - - - - - - -	0	14	0
Expences on cattle - - - - - - - -	0	4	0
Fifteen crones - - - - - - - - -	4	5	0
Manuring two acres as above - - - -	5	9	4
	28	6	4

Seventh Year.	l.	s.	d.
Rent, &c. - - - - - - - - - - -	15	0	0
Mowing and making twelve acres - - -	1	16	0
Stacking, &c. - - - - - - - - - -	1	16	0
Weighing, &c. - - - - - - - - - -	0	18	0
Twenty crones - - - - - - - - -	5	0	0
Expences on cattle - - - - - - - -	0	5	0
Manuring as above - - - - - - - -	5	9	4
	30	4	4

Eighth Year.	l.	s.	d.
Rent, &c. - - - - - - - - - - -	15	0	0
Mowing and making eight acres - - - -	1	4	0
Stacking, &c. - - - - - - - - - -	1	4	0
Weighing, &c. - - - - - - - - - -	0	10	0
Twenty crones - - - - - - - - -	5	10	0
Expences - - - - - - - - - - -	0	7	0
Manuring two acres as above - - - -	5	9	4
	29	4	4

Ninth Year.	l.	s.	d.
Rent, &c. - - - - - - - - - - -	15	0	0
Mowing and making ten acres - - - -	1	10	0
Stacking, &c. - - - - - - - - - -	1	10	0
Weighing, &c. - - - - - - - - - -	0	8	0
Twenty crones - - - - - - - - - -	3	15	0
Expences on cattle - - - - - - - -	0	10	0
	22	13	0

P R O-

PRODUCE.

First Year.

	l.	s.	d.
Ten loads of hay, wasted to eight, and sold in the winter at two pounds per load - -	16	0	0
Fifteen old crones sold fat, with their lambs at fifteen shillings per couple - - - -	11	5	0
As no expences are calculated for the dairy, such as wood, utensils, &c. I shall lay the clear profit of the cows at four pounds each, which is what I have generally made of mine, every thing paid, and yet kept a calf now and then for stock: one I reckon this year - - - - - - - - - - - -	12	0	0
I shall not explain all the method of managing the hogs, but lay the clear profit of a sow at different sums, such as I have generally found my own produce - - - -	6	0	0
	45	5	0

Second Year.

Eight loads of hay wasted to seven, and sold at two pounds per load - - - - -	14	0	0
Twenty crones, sold fat at seventeen shillings per couple - - - - - - - - - -	17	0	0
Three cows, at four pounds each - - -	12	0	0
One sow - - - - - - - - - - -	6	5	0
	49	5	0

Third Year.

Ten loads of hay, wasted to eight, sold at two pounds per load - - - - - - -	16	0	0
Fifteen crones, sold at fifteen shillings per couple - - - - - - - - - - -	11	5	0
Four cows, the new one at three pounds (the calf is now a cow) - - - - - - -	15	0	0
One sow - - - - - - - - - - -	6	10	0
	48	15	0

Fourth Year.

Fourteen loads of hay wasted to twelve -	24	0	0
Fifteen crones, sold per couple at fifteen shillings - - - - - - - - - - -	11	5	0
Four cows, the new one three pounds five shillings - - - - - - - - - - -	15	5	0
One sow - - - - - - - - - - -	7	0	0
	57	10	0

Fifth Year.

Twelve loads of hay wasted to ten - - -	20	0	0
Fifteen crones, sold per couple at sixteen shillings - - - - - - - - - - -	12	0	0
Four cows, the new one at three pounds ten shillings - - - - - - - - - - -	15	10	0
One sow - - - - - - - - - - -	5	0	0
	52	10	0

Sixth Year.

Ten loads of hay wasted to eight - - -	16	0	0
Fifteen crones, sold per couple at 16 shillings	12	0	0
Four cows - - - - - - - - - - -	16	0	0
One sow - - - - - - - - - - -	7	10	0
	51	10	0

Seventh Year.

Fourteen load of hay wasted to twelve - -	24	0	0
Twenty crones, sold per couple at seventeen shillings - - - - - - - - - - -	17	0	0
Four cows - - - - - - - - - - -	16	0	0
One sow - - - - - - - - - - -	5	0	0
	62	0	0

Eighth Year.

	l.	s.	d.
Twelve loads of hay wasted to ten - - -	20	0	0
Twenty crones, sold per couple at sixteen shillings - - - - - - - - - - -	16	0	0
Four cows - - - - - - - - - - - -	16	0	0
One sow - - - - - - - - - - - -	5	15	0
	57	15	0

Ninth Year.

Twelve loads of hay wasted to ten - - -	20	0	0
Twenty crones, sold per couple at fourteen shillings - - - - - - - - - - -	14	0	0
Four cows - - - - - - - - - - - -	16	0	0
One sow - - - - - - - - - - - -	7	0	0
	57	0	0

Expences.	l.	s.	d.	Produce.	l.	s.	d.
1st Year - -	45	16	10	1st Year - -	45	5	0
2d Year - -	28	16	10	2d Year - -	49	5	0
3d Year - -	27	6	4	3d Year - -	48	15	0
4th Year - -	29	4	4	4th Year - -	57	10	0
5th Year - -	27	15	10	5th Year - -	52	10	0
6th Year - -	28	6	4	6th Year - -	51	10	0
7th Year - -	30	4	4	7th Year - -	62	0	0
8th Year - -	29	4	4	8th Year - -	57	15	0
9th Year - -	22	13	0	9th Year - -	57	0	0
	269	8	2		481	10	0
					269	8	2
					212	1	10

Which is twenty-three pounds eleven shillings and two-pence per annum, or one pound three shillings per acre profit.

The above account displays the vastly superior advantages of grass, with us, to arable land.

You will certainly remark, that nothing in the above account is reckoned for losses of stock; but in answer to that I should observe, that nothing is calculated in the arable account for some bad years, when in such land not a quarter of a crop is produced: and I do not mean this calculation as perfect (that is impossible) but only to discover the proportion between the one method and the other; and from what I have observed, and gathered from the information which the most intelligent farmers can give me, I am clearly of opinion, that the chances, on the whole, are much in favour of the grass-land, the crop of hay and seed being much more regular than those of corn, clover, or turneps; and supposing the eighty bushels of clover-seed, yet the grass profit far exceeds the arable, even then; but, as I observed, the probability lies against the latter, supposing the profit to be only fifteen pounds fourteen shillings and eight-pence per annum.

I may remind you, that I supposed this twenty acres to be an addition to a farm, not one by itself, and so compared the respective profits; therefore I have not allowed any thing for the seed which the above-mentioned cattle may accidentally have on the arable land, or turneps which they may expend in the winter; and for this reason, because, although it appears to me that grass is the most profitable husbandry, yet a certain quantity of ploughed land should undoubtedly be a part of every grass-farm, for the raising turneps, some artificial grass, and stover enough for the winter's food.

I hope your readers will peruse this calculation with candour, and believe me, when I assure them it is the nearest truth of any I can make, either from my own experience, or best information. *Museum Rusticum, vol.* III. *p.* 317.

State of the Expence of a hoed Crop of Wheat, and the Profit of it compared with that of the common Husbandry.

I propose here to state the expence of a hoed wheat-crop. If this is done in any place where the price of labour is known, it will be easy from thence to calculate the expence of such crops in any other places.

 When

When wheat is to be horfe-hoed, it is planted upon three-bout ridges, about four feet and eight or nine inches broad. If the foil is poor, they may be made broader, but fhould not be much narrower, otherwife there will not be room enough to plough the intervals. Two rows of wheat, about ten inches afunder, are drilled upon the top of each ridge, and then the intervals or fpaces between the double rows will be about three feet and ten inches wide.

For the firft crop the land fhould be well prepared, and very clean: it will therefore coft more than the following crops; and if the land is not in good heart, the firft crops will be the fmalleft, for hoeing greatly improves it. The following eftimate is of the fucceeding crops.

The neceffary culture for thefe is, once ploughing in autumn, to form the new ridges for the next crop. This may be done with three horfes; for the intervals, by frequent hoeing, are kept in fine tilth, and are ploughed at one bout; and the middle of the ridges where the laft crop ftood, being only the breadth of two narrow furrows, are eafily ploughed at another bout; fo that thefe ridges, which in common ploughing required three bouts with four horfes, are now ploughed at two with three horfes.

The intervals, after the corn is planted, are hoe-ploughed at one bout, to or from the rows. They are ufually thus ploughed four times, once in the beginning of winter, and three times afterwards in the fpring and fummer.

The ten inch partitions, or fpaces, between the rows of wheat, are hand-hoed about the end of March: once is generally fufficient, becaufe the wheat foon afterwards fpreads, covers the partitions, and keeps down the weeds. The rows are alfo to be weeded. This is all the ploughing and hoeing that is commonly neceffary till harveft. But as in fome years it may be proper to plough the ridges in autumn at five or fix furrows, or plough them twice, fometimes to hoe-plough the intervals more than four times, or to give them a trench-ploughing, where the ftaple is deep enough to admit of it, I fhall make a full allowance for thefe, and charge two ploughings and fix horfe-hoeings every year.

The hiring price in fome parts of Middlefex for ploughing a ftrong loam the firft time, in the common way, is feven or eight fhillings an acre; I fhall fay eight fhillings. They work about eight hours, and plough about an acre a day with four horfes. The price of the labour may be thus diftinguifhed: to the ploughman twenty-pence, and boy eight-pence a day, including their beer; and then the horfes and harnefs, &c. will come to feventeen-pence a day each. Twice ploughing therefore in autumn, with three horfes, comes to eight fhillings and nine-pence.

The tops of the ridges are to be rolled with a light roller, or harrowed once or twice with two very light harrows, to break the clods, and lay the tops of the ridges fmooth for drilling. The harrows are faftened together by a pole; and a horfe, walking in the furrow, draws the two harrows, one upon each ridge. A rolling in the fame manner is alfo ufeful in the fpring, when the earth is pretty dry, and before the partitions are hand-hoed. Thefe rollings and harrowings, of two ridges at once by once horfe, are done at a fmall expence; and not being neceffary every year, may coft about four-pence: but to make the total an even fum, I fhall charge for them (and uncovering the plants, if any clods happen to fall upon them at the firft hoe-ploughing) feven-pence halfpenny per acre.

The ufual quantity of feed is three pecks, and if it cofts five fhillings and fix-pence per bufhel, is four fhillings and three halfpence per acre. The drilling is performed by a man and boy, and one horfe. They may drill fix acres a day: I fhall fay but five, which is ninepence per acre.

The intervals fhould be kept in fine tilth: they are hoe-ploughed at one bout: three horfes are fufficient for the firft two hoeings, and two for the reft. I fhall reckon three for each hoeing, and then fix hoeings come to thirteen fhillings and two-pence.

The price for hand-hoeing of beans the firft time is about five fhillings per acre; I fhall call it fix; and as the ten inch partitions, and about two inches on each outfide of the rows, is the whole to be hand-hoed (for the hoe-plough does the reft) thefe are about one fourth part of the ridge, and fhould be done for eighteen-pence an acre: but it is a good way to agree with the hoers to cleanfe the rows alfo of weeds; and as thefe ought to be well done, they expect fomething more than for common work, and they will coft near half a crown per acre.

For reaping the prices are various; from five or fix, to ten fhillings per acre; at a medium, eight fhillings is a high price. The drilled wheat, having fcarcely any weeds in it, and ftanding upon only about a fourth part of the ridge, is eafier and much quicker reaped than fown wheat, and not really worth above half the common price; but, for the above reafon, I fhall allow, for reaping and carrying fix fhillings per acre.

Wheat-ftraw is a valuable article in the neighbourhood of London; and the ftraw, chaff, &c. might be reckoned here to pay for threfhing and carrying the corn to market: where it is otherwife, an allowance is to be made. And as the diftance from the market is uncertain, I fhall charge the carrying out, and at market, a fhilling per quarter, befides the value of the ftraw.

Some eftates are tythe-free; others pay in kind, or a modus. I fhall reckon the tythe at four fhillings per acre.

Suppofe the rent is fixteen fhillings per acre, there remain to be added the taxes, or rates payable by the tenant, which, at two fhillings in the pound-rent, come to nineteen-pence per acre.

I reckon nothing for dung or manure; for land that is proper for wheat, allowing fufficient intervals and hoeing, requires none. If the wheat of the firft crops is weak in the fpring, a top-dreffing of the rows will be of fervice, or afterwards, if the proper hoeings have not been given the preceding year; but this feldom happens; for hoeing makes the plants ftrong, and if then alfo top-dreffed, they would be in danger of lodging.

The whole expence, at thefe prices, of horfe-hoed wheat, is, per acre, as follows:

	l.	s.	d.
Two ploughings in autumn, with three horfes	0	8	9
Harrowing, feed, and drilling - -	0	5	6
Six hoe-ploughings of the intervals, with three horfes - - - - -	0	13	2
Hand-hoeing, weeding, and harvefting	0	8	6
Carrying out twenty bufhels, and at market, (befides the value of the ftraw and chaff) at one fhilling per quarter - -	0	2	6
Tythe, rent, and taxes - -	1	1	7
	3	0	0

This is the whole expence, fuppofing the foil to be a ftrong loam, the wages high, and the horfes hired; but when done by the farmer's own horfes, or the foil lighter, and they work more hours in a day, the expence will be a great deal lefs, as we fhall fee below: in fome places it will not much exceed half this fum.

It has been already fhewn, that one hundred acres of horfe-hoed wheat, much of it a light, poor foil, produced near twenty bufhels per acre; and that a ftrong foil, by a medium of twenty hoed crops, produced about twenty-four bufhels per acre, both nine-gallon meafure; and therefore we might reckon here a middling crop about twenty-four bufhels: but to avoid all fufpicion of partiality, I fhall fuppofe, that a good loam may, one year with another, produce only the leaft of thefe, or twenty bufhels per acre.

The mean price of wheat at Windfor market, for the laft twenty years, ending at Michaelmas, 1762, is nearly four fhilling and eight-pence three farthings per bufhel; and twenty bufhels, at this rate, come to four pounds fourteen fhillings and feven-pence; fo the profit of the horfe-hoed wheat is one pound fourteen fhillings and feven-pence per acre, or above two rents.

Your ingenious correfpondent has above ftated the produce and expence of twenty acres of arable land for nine years, according to the courfe of hufbandry practifed in his neighbourhood, I fhall, by way of comparifon, calculate the profit of thefe twenty acres, fuppofing they had

had been under crops of hoed wheat during theſe nine years.

I reckon, from your correſpondent's account, the wages of his ploughmen to be about fourteen pence, and a boy four-pence a day (if not allowed beer) and the horſes a ſhilling a day each; in all, five ſhillings and ſix-pence, beſides repairs: and if they work more than eight hours, his land being lighter than the above, they may plough about an acre and a half a day, which brings the price for ploughing to near his reckoning of four ſhillings per acre. If this is not exact, he will rectify it. I ſhall ſtate the ploughings and horſe-hoeings in this proportion, and allow three horſes, though fewer will do in this land. The rent-charges, I ſuppoſe, include the tenant's taxes; if not, they are to be added to the expence. As the tythe is not mentioned in his account, I do not charge it here. The other items are computed in proportion to his, and the above, ſtate of the expence; and as I abated four buſhels in the above crop per acre, I ſhall do the ſame here, and reckon a middling crop of hoed wheat at only eighteen buſhels; his producing, by a medium of three crops, twenty-two buſhels and two fifths per acre. The expence of a horſe-hoed acre of this land will be nearly as follows:

				l.	s.	d.
Twice ploughing in autumn, with three horſes, and harrowing - - -				0	3	0½
Seed three pecks (fifteen ſhillings and four-pence per coomb at a medium) and drilling five acres a day - - -				0	3	4½
Six hoe-ploughings, with three horſes				0	4	0
Hand-hoeing (at four ſhillings per acre, reckoned for turnips in the account) and weeding - - - -				0	1	8
Harveſting, three ſhillings and nine-pence: threſhing four coomb and a half, four ſhillings and ten-pence - -				0	8	7
Carrying out four coomb and a half, and at market - - - -				0	4	1½
Rent-charges - - -				0	15	0
Total expence per acre				1	19	9½
The three crops of wheat were ſold, at a medium, for fourteen ſhillings and five-pence and four ſevenths per coomb, which, for eighteen buſhels, comes to -				3	5	0½
Profit per acre				1	5	3
The twenty acres, in nine years, produced ſeven crops, valued at five hundred and three pounds; but in the ninth year, the crop of ſixty coomb is caſt by miſtake at eighty-ſeven pounds, which ſhould be but half that ſum; deducting therefore forty-three pounds ten ſhillings, the produce amounts to - - -				459	10	0
The expence of theſe twenty acres in nine years, as charged - - -	361	10	3	381	10	0
To which is to be added for four hundred loads of dung	20	0	0			
Remains the profit in nine years				77	19	9
Which is, per acre per annum, near				0	8	8

There were eight hundred loads of dung laid upon theſe twenty acres; but it is hardly to be ſuppoſed, that that half that quantity could be made from the ſeven crops; ſo that at leaſt four hundred loads muſt be had elſewhere; and the dung is at a high price in that neighbourhood. I have charged but a ſhilling a load for it.

But if it ſhould be ſuppoſed, that more than four hundred loads could be made from theſe ſeven crops, it muſt alſo be admitted, that a quantity in proportion would be made from the nine crops of wheat, which not being neceſſary in the hoeing culture, is worth, to be ſold, more per load than I have reckoned above; and the value of it ſhould then be added to the profit of the hoed crops.

Let us next compare the whole profit of theſe twenty acres in nine years, in both theſe methods of huſbandry.

	l.	s.	d.
The profit, in nine years, of the hoed crops, amounts to - - -	227	5	0
The profit in that time by the common huſbandry - - - -	77	19	9
Balance in favour of the New Huſbandry	149	5	3

Hence appears the great ſuperiority of the hoeing culture; and even allowing the clover had produced four buſhels of ſeed per acre, the New Huſbandry is ſtill by far the moſt profitable.

HYACINTH, the name of a very beautiful genus of flowers, of which ſeveral ſpecies are now cultivated in the Engliſh gardens.

All the different ſorts of hyacinths are propagated by ſeeds, or of ſets from the old bulbs; the former method has been but little practiſed in England till very lately; but in Holland and Flanders, it has been followed many years, and by this means they have obtained an amazing variety of the moſt beautiful flowers. Few floriſts in England think it worth while to wait four or five years for the flowers of a plant, which, when produced, might not perhaps deſerve to be preſerved; but they do not conſider that it is only the loſs of the firſt four or five years after the ſowing; for if they continue ſowing every year after they begin, there will be a ſucceſſion of flowers annually, which will conſtantly produce ſome ſorts different from what they were before poſſeſſed of; and new flowers being always the moſt valuable to ſkilful gardeners, they will always prove a ſufficient recompence for their trouble and loſs of time beſtowed on their culture.

The method of raiſing theſe flowers from ſeed, is as follows: Firſt, let a ſufficient quantity of good ſeed (which ſhould be ſaved either from ſemi-double, or ſuch ſingle flowers as are large, and have good properties) be provided: Secondly, One or more ſhallow boxes, or pots, ſhould be procured, which muſt be filled with freſh, light, ſandy ſoil, laying the ſurface very level, on which the ſeeds ſhould be ſown as equally as poſſible, and covered about half an inch thick with the ſame light earth: the time for this work is about the middle of Auguſt. Theſe boxes or pots ſhould be placed where they may enjoy the morning ſun only, till the latter end of September, at which time they ſhould be removed into a warmer ſituation, and about the latter end of October be placed under a common hot-bed frame, where they may remain during the winter and ſpring months, to be protected from hard froſts; but they ſhould be expoſed to the open air, when the weather is mild, by taking off the glaſſes. In February or March, the young plants will begin to appear above ground, at which time they muſt be carefully ſcreened from the froſts, otherwiſe they will be deſtroyed while ſo young; but they muſt not be covered at that ſeaſon, except in the night, or very bad weather; for when the plants are come up, they will, if too cloſe covered, draw up very tall and ſlender, and thereby prevent the growth of their roots. At the end of March, if the weather prove good, they may be removed out of the frame, placing them in a warm ſituation; and, if the ſeaſon proves dry, they ſhould now and then have a little water, and be kept very clear from weeds, which would ſoon overſpread the tender plants, and deſtroy them.

Towards the latter end of April, or the beginning of May, theſe boxes ſhould be removed into a cooler ſituation; for the heat of the ſun at that ſeaſon would be too great for theſe tender plants, cauſing their blades to decay much ſooner than they would, if they were ſcreened from its violence. In this ſhady ſituation they ſhould remain during the heat of ſummer, obſerving to keep them conſtantly clear from weeds; but you muſt not place them under the dripping of trees, &c. nor ſhould you give them any water after their blades are decayed; for that would infallibly rot their roots. About the latter end of Auguſt, you ſhould ſift a little light rich earth over the ſurface of the boxes, and then remove them again into a warmer ſituation, and treat them, during the winter, ſpring, and ſummer months, as was before directed; and the ſecond year, about the middle of Auguſt, ſhould be prepared a bed of light, rich, ſandy ſoil, in proportion to the quantity of ſeedling roots, the ſurface of which ſhould be be very even; then take out the earth from the boxes in which the plants were raised, into a sieve, in order to get out all the roots, which, by this time, if they have grown well, will be about the size of small pease: these roots should be placed upon the bed at about three inches asunder, observing to set the bottom part of their roots downwards; then they should be covered over two inches thick with the same light earth; but as it will be impossible to get all the small roots out of the earth in the boxes, the earth should be spread upon another bed equally, and covered over with light earth, by which method none will be lost, be they ever so small.

These beds must be arched over with hoops, and in very hard frosty weather must be covered with mats, &c. to protect them from frost; and in the spring, when the green leaves are above ground, if the weather should be very dry, they should have a little water sparingly; for nothing is more injurious to these bulbs than too great quantities of moisture. During the summer season, the beds must be kept clear from weeds; but after the blades are decayed, the roots should not have any water: in autumn the surface of the bed should be stirred with a very short hand-fork, being exceeding careful not to thrust it so deep as to touch the roots, which, if hurt, are very subject to perish soon after. Then a little fresh, light, rich earth, should be sifted over the bed about an inch thick, or something more. In winter, the beds should be covered again as above directed. In this bed the roots may continue two years; the third summer when the leaves are decayed, the roots should be carefully taken up, and may be kept out of the ground till August, when they should be planted into new beds, prepared as before, at the distance of six inches asunder; in these beds the roots may remain till they flower, during which time they should be treated as before, with this difference only, that instead of covering them with mats in the winter, the surface of the ground should be covered with tanners-bark.

When the flowers begin to shew themselves, those which have good properties should be marked, by thrusting a small stick down by each root; which roots at the time of taking them up should be selected from the rest, and planted by themselves, though it is by no means advisable to reject any of the other roots till they have blown two years, before which their worth cannot be ascertained. When the roots are taken up, they should be laid into the earth again in an horizontal position, leaving the green leaves hanging downwards from the roots, whereby the great moisture contained in their very succulent leaves and flower-stalks will be exhaled, and prevented from entering the roots, which when suffered to return into them, is very often the cause of their rotting. In this position the root should remain until the leaves are quite dried off, when they must be taken up, and after being cleared from all manner of filth which would be hurtful to them, they must be laid up in boxes, where they may be preserved dry until September, which is the proper season for planting them again.

We shall now proceed to the culture of such hyacinths as either have been obtained from Holland, or have been produced from seeds in England. The want of skill in this particular has occasioned the ill-success most people have had with them here, which has occasioned their being so much neglected, supposing their roots to degenerate after they have flowered in England; which is a great mistake, for were the roots managed with the same art as is practised in Holland, there is no reason to doubt but they would thrive full as well with us as there.

The soil in which these flowers succeed best, is a light, sandy, fresh, rich, loamy earth, which may be composed after the following manner: take half fresh earth from a common, or pasture-land, which is of a sandy loam; this should not be taken above eight or nine inches deep at most; and if taken with the turf, or green sward with it, it will still be better, provided it has time to rot; to this should be added a fourth part of sea-sand, and the other fourth part of rotten cow-dung: these should be well mixed together, and thrown into a heap, where the whole may remain till wanted; but the whole should be turned over once every month. If this compost be made two years before it is used, it will be much the better; but if used, sooner, it should be turned oftener, that the parts may the better unite.

This soil should be laid two feet deep in the beds which are designed for hyacinths, and a little rotten cow-dung, or tanners-bark may be laid at the bottom, which will be within reach of the fibres, but should by no means touch the bulb. If the soil be very wet where these beds are made, they should be raised ten or twelve inches above the surface; but if it be dry, they need not be raised above three or four.

The best season for planting these roots is towards the middle or latter end of September, according to the earliness or lateness of the season, or the weather which then happens; but it is advisable never to plant them when the ground is extremely dry, unless there be a prospect of some rain soon after; for if the weather should continue dry a considerable time after, the roots will contract a mouldiness, which will certainly destroy them.

These beds will require no farther care until the frost comes on, at which time they should have some rotten tan spread over the bed, about four inches thick; and if the alleys on each side of the bed are filled up, either with rotten tan, dung, or sand, it will prevent the frost from penetrating the ground to the roots, and secure them from being destroyed; but when the winters prove very severe, it will also be proper to have some pease-haulm, or such like covering laid over them, which will keep out the frost better than mats. But this covering should be taken off whenever the weather is mild, and only continued on in very hard frosts; for where the beds are covered with tan or sea-coal ashes, no common frost can penetrate through, so the other coverings are useless, except in very severe frosts. In February, when the leaves begin to appear, the beds must be arched over with hoops, that they may be covered either with mats, canvas, or some other light covering, to prevent the frost from injuring the buds as they arise above ground; but these coverings must be constantly taken off every day when the weather is mild; otherwise the flower-stems will be drawn up weak, and the foot-stalks of the flowers will be slender, and so rendered incapable of supporting the bells, which is a great disadvantage to the flowers. When these hoops are fixed over the beds, the rotten tan should be taken off; in the doing of which, great care should be taken not to bruise or injure the leaves of the hyacinths which are then coming up.

When the stems of the flowers are advanced to their height, before the flowers are expanded, short sticks should be placed by each root, to which, with a wire formed into a hoop, the stem of the flowers should be fastened, to support them from falling, otherwise, when the bells are fully expanded, their weight will incline them to the ground.

During their season of flowering they should be covered in the heat of the day from the sun, and also from all heavy rains; but they should be permitted to receive gentle showers, as also the morning and evening sun; but if the nights are frosty, they must be constantly defended therefrom. With this management the flowers may be continued in beauty at least three weeks or a month, and sometimes more, according to their strength, or the favourableness of the season.

When their flowers are quite decayed, and the tops of their leaves begin to change their colour, their roots should be lifted with a narrow spade, or some other handy instrument: in the doing of this, the instrument must be carefully thrust down by the side of the root, so as not to bruise or injure it, as also to put it below the bottom of the root; then by the forcing of this instrument on one side, the fibres of the roots are raised and separated from the ground. The design of this is to prevent their receiving any more nourishment from the ground, for by imbibing too much moisture at this season, the roots frequently rot after they are taken up: about a fortnight after this operation, the roots should be entirely taken out of the ground, and then the earth of the beds should be raised into a sharp ridge, laying the roots into it in an horizontal position, with their leaves hanging out, by which means a great part of the moisture contained in their thick succulent stalks and leaves will evaporate, which,

which, if permitted to return back to the roots, would cause them to rot and decay after they are taken up, which has been the general defect of most of the hyacinths in England.

In this position the roots should remain until the green leaves are entirely decayed, which perhaps may be in three weeks time. This is what the Dutch gardeners term, the ripening of their roots, because by this method the roots become firm, and the outer cover is smooth, and of a bright purple colour; whereas those roots which are permitted to remain undisturbed, till the leaves and stalks are quite decayed, will be large, spongy, and their outer coats will be of a pale colour; for the stems of many of these flowers are very large, and contain a great quantity of moisture, which, if suffered to return into the roots, will infallibly cause many of them to perish. After they are so ripened, they may be taken out of the ground, and wiped clean with a soft woollen cloth, taking off all the decayed parts of the leaves and fibres, putting them into open boxes where they may lie singly, and be exposed to the air; but they must be preserved carefully from moisture, nor should they be suffered to remain where the sun may shine upon them. In this manner they may be preserved out of the ground until September, which is the season for planting them again, at which time you must separate all the strong flowering roots, planting them in beds by themselves, that they may make an equal appearance in their flowers; but the off-sets and smaller roots should be planted in another separate bed for one year, in which time they will acquire strength, and by the succeeding year will be as strong as the older roots.

There are some persons who let their hyacinth roots remain two or three years unremoved, by which they have a much greater increase of roots than when they are annually taken up; but the roots by this great increase are frequently degenerated, so as to produce single flowers; therefore it is most advisable to take up the roots every year, which is the most certain method to preserve them in their greatest perfection, though the increase may not be so great. Those roots which are annually removed will be rounder and firmer, than such as stand two years unremoved. *Miller's Gard. Dict.*

HYSSOP, a well known herb, cultivated in every kitchen garden.

It is propagated either by seeds, or slips; and if by seeds, they must be sown in March, upon a bed of light, sandy soil, and when the plants come up, they should be removed to the places where they are to remain, placing them a foot asunder, at least, each way; but if they are designed to abide in this place for a long time, two feet distance will be little enough, for they grow pretty large, especially if they are not frequently cut to keep them within compass: they thrive best upon a poor, dry soil, in which situation they will endure the cold of our climate better than when they are planted in rich ground. If they are propagated by slips, they should be planted either in spring or autumn, in a bed of light earth, where they will take root in about two months, after which they are to be transplanted where they are to continue, managing them as before directed for the seedling plants. *Miller's Gard. Dict.*

J.

JACK, an instrument for turning the spit; also a contrivance for supplying the place of a boy in pulling boots off. It also signifies a support for sawing wood upon.

JAMOCK, or *jannock*, oaten bread made into large loaves.

JARDON, a name given by farriers to a swelling on the out-side of the back of a horse.

It generally proceeds from blows and kicks of other horses; but frequently happens to managed horses, by setting them on their haunches: it is seldom attended with much lameness, unless it has been neglected, or some little process of the bone broken. It should be first treated with coolers and repellents, such as hot vinegar, verjuice, &c. but if any swelling continues hard and insensible, the best way is to blister or fire; but mild blisters alone generally succeed. *Bartlet's Farriery, page* 263.

JAUNDICE, a distemper incident to horses, and generally called, by farriers, the yellows.

Horses are frequentty subject to this distemper, which is known by a dusky yellowness of the eyes; the inside of the mouth and lips, the tongue and bars of the roof of the mouth looking also yellow. The creature is dull, and refuses all manner of food; the fever is slow, yet both that and the yellowness increase together. The dung is often hard and dry, of a pale yellow, or light pale green. His urine is commonly of a dark dirty brown colour; and, when it has settled some time on the pavement, it looks red like blood. He stales with some pain and difficulty, and if the distemper is not checked, soon grows delirious and frantic. The off-side of the belly is sometimes hard and distended; and in old horses, when the liver has been long diseased, the cure is scarce practicable, and ends fatally with a wasting diarrhæa: but when the distemper is recent, and in young horses, there is no fear of a recovery, if the following directions are observed.

> First of all, bleed plentifully; and give the laxative clyster, as horses are apt to be very costive in this distemper; and the next day give him this purge.

> Take of Indian rhubarb, powdered, one ounce and a half; saffron two drams, succotrine aloes six drams, syrup of buckthorn a sufficient quantity.

If the rhubarb should be found too expensive, omit it, and add the same quantity of cream of tartar, and half an ounce of Castile soap, with four drams more of aloes. This may be repeated two or three times, giving intermediately the following balls and drink.

> Take of Æthiop's mineral half an ounce; millepedes the same quantity, Castile soap one ounce; make into a ball, and give one every day, and wash it down with a pint of this decoction.

> Take madder root and turmerick, of each four ounces; burdock root sliced, half a pound; Monk's rhubarb four ounces; liquorice sliced two ounces: boil in a gallon of forge water to three quarts; strain off, and sweeten with honey.

Balls of Castile soap and turmerick may be given also for this purpose, to the quantity of three or four ounces a day, and will in most recent cases succeed.

By these means the distemper generally abates in a week, which may be discovered by an alteration in the horse's eyes and mouth; but the medicines must be continued till the yellowness is intirely removed. Should the distemper prove obstinate, and not submit to this treatment, you must try more potent remedies, viz. mercurial physic, repeated two or three times at proper intervals; and then the following balls:

> Take salt of tartar two ounces, cinnabar of antimony four ounces, live millipedes and filings of steel, of each four ounces, Castile or Venice soap half a pound: make into balls of the size of pullets eggs, and give one night and morning, with a pint of the above drink.

It will be proper, on his recovery, to give him two or three mild purges, and, if a full fat horse, to put in a rowel. *Bartlet's Farriery, page* 156.

ILES, or *oiles*, the beards or the ears of barley, wheat, &c.

INARCHING. *See* GRAFTING.

INCLOSURE, the separation of common grounds into distinct possessions.

The inclosing of lands, and dividing them into different fields, pastures, &c. is a most essential part of their real improvement, and attended with many very considerable advantages, of which we shall here mention only the following:

Inclosures ascertain to every man his just and due property, and thereby prevent an infinity of trespasses, injuries, and other sources of ruinous litigation. They keep the land warm, and add to its fertility, by screening it from violent and nipping winds, which otherwise frequently destroy whole crops; and they also defend it from those drying and scorching winds, which so often blast at once the husbandman's, till then well grounded, expectation. They afford shade in the summer, and shelter in the winter, for cattle, which would otherwise destroy more with their feet than they eat with their mouths, and which, for want of these, might, as Mr. Worlidge observes, lose more of their fat or flesh in one sultry day, than they gain in three cold ones. Their cuttings afford fuel to the industrious husbandman, and, if carefully planted and preserved, they will here and there furnish him with timber for his carts, ploughs, and other utensils, besides sometimes useful fruits. They are an excellent encouragement to good husbandry, and a great remedy against beggary, by employing many poor people in the labour which either the making, or the mending of them constantly requires, and which is amply repaid by the increase of crops: for it has been remarked, not only that well inclosed countries generally maintain treble the number of inhabitants, or more, than the champaign; but also, that those inhabitants are much better fed and clad, than the common run of people in uninclosed lands. To be convinced of this, let any one but examine our vast downs, commons, heaths, wastes, and unimproved forests, badges yet remaining, as Mr. Worlidge properly terms them, of poverty and idleness; but at the same time, thoroughly susceptible of being converted, with proper care, into corn and pasture fields, meadows, gardens, orchards, and pleasant groves, the marks of industry and good husbandry. Let him but compare the naked parts of Wiltshire, Gloucestershire, Hampshire, Surry, &c. with the delightful parts of Kent, Herefordshire, and other countries, and he cannot but be struck with a demonstration of the immensely valuable improvements which may yet be made in very many parts of this kingdom. The now unimproved, un-occupied crown-lands, might alone, or even only a part of them, be rendered an inexhaustible source of unequalled wealth to the sovereign, of a vast increase of his subjects, and of happiness to all.

The common objection against inclosures have been so well refuted by many very able writers, and are daily invalidated by that most unerring test, experience, that it would be needless for us to recapitulate them here: we therefore shall only point out one farther essential advantage attending this great improvement, which is, that it enables the farmer to act as is most agreeable to him in sowing when, and what, he pleases.

Every gentleman, whose estate is not yet inclosed, and who is consequently at liberty to choose the manner and means of doing it, will rationally begin with having a map of it drawn, that he may thereby be enabled to divide and portion it out, with the greater propriety and precision, so as to render it most pleasing to the eye, and most convenient to each farmer. If he has a place of residence upon it, he may make the whole become ornamental to that residence, by a judicious disposition of his hedges and plantations, as has been nobly done at Boughton, in Northamptonshire, by the late duke of Montague, who, with a most refined taste, and truly benevolent mind, disdaining all the little and confined ornaments of a park, executed his fine improvements there in such a manner, as to render them pleasingly beneficial to all his neighbours, as well as to every person settled upon his land. Gubbins, in Hertfordshire, the seat of Sir Jeremy Sambrook, is another charming example of elegance, though less extensive than the former.

Ha-ha walls, and pieces of water, with rails running across them, are an easy means of preserving a fenced level.

The farms should be so divided, that the dwelling of each tenant may be as contiguous to his land as conveniency will admit of, to prevent length of carriage, and to facilitate his due attendance.

Small farms have always been observed to yield the greatest proportional rent, and small inclosures constantly produce the most plentiful crops.

Inclosures for arable lands should be larger than for pastures, that the soil may be kept dry, and the corn be well aired. For the manner of making inclosures, *see the article* FENCE.

ING, a common pasture or meadow.

INOCULATION, a very curious operation in gardening, otherwise called budding.

It is a kind of grafting practised in the summer months on several kinds of stone fruits, as peaches, nectarines, cherries, plums, apricots, &c. also upon oranges, jasmines, and various other sorts of plants, which succeed better by this practice, than by the common method of grafting. The operation is performed in the following manner:

Being provided with a sharp knife, with a flat haft, made for this purpose, as also with the cuttings of the tree intended to be propagated, make choice of a smooth part of the stock intended to be inoculated; if designed to be dwarf, five or six inches from the ground: but if a standard, it should be budded at the height of five and a half, or six feet; then, with your knife, make an horizontal cut acroſs the rind of the ſtock, and from the middle of that cut make a ſlit downwards about two inches in length, being careful not to cut deeper than the thickneſs of the bark, leſt the ſtock is wounded; then having the cutting ready, cut off the leaf from the bud, leaving the foot-ſtalk remaining; cut the bud off lengthways, ſomewhat longer than the ſlit in the ſtock, with part of the wood to it; this done, with your knife ſlip the wood from the bark with a ſudden jerk, and obſerve whether the eye of the bud is left or not, for thoſe buds which loſe their eyes in ſtripping are uſeleſs; then with the handle of the knife gently raiſe the bark on each ſide of the ſlit in the ſtock, and inſert the bud therein, obſerving to place it ſmooth between the rind and wood of the ſtock, cutting off that part of the rind of the bud which may happen to be too long for the ſlit made in the ſtock; ſo having exactly fitted the bud to the ſtock, tie them cloſely round with wetted ſtrong baſs, taking care not to bind round the eye of the bud, which ſhould be left open. In about three weeks or a month, the buds will require to be looſened of the bandage, which, if not done in time, will be very injurious to them, but not to be intirely diveſted of the binding, as it is not amiſs to ſlightly tie them again, which will prevent the bark of the ſtock from flying open, as ſometimes happens, whereby the bud is much injured, if not entirely deſtroyed.

The March following, the ſtock ſhould be cut off about three inches above the place of inoculation, ſloping it the contrary way to the bud; this length is of uſe to faſten the ſhoot which proceeds from the bud, which otherwiſe might be blown out by ſtrong winds: but the autumn following, it ſhould be cut cloſe juſt above the bud, that the place of amputation may the more readily be barked over.

The time for inoculation, is from the middle of June to the latter end of Auguſt, according to the ſeaſon and the forwardneſs of the different ſorts of trees intended to be budded, which muſt be known by trying if the buds will ſeparate from the wood eaſily. The firſt ſort of fruit commonly inoculated, is the apricot, and the laſt the orange; although the orange is commonly budded in Auguſt, it is very proper to try the operation in July, and thoſe ſtocks which miſcarry may be budded the ſucceeding month, or even in September; but let it be done when it will, it is proper to place them in a gentle heat, giving them plenty of water, by which means there will be no reaſon to doubt of their ſucceſs.

In performing this operation, it will be neceſſary to take the opportunity of moiſt cloudy weather, as the bud and ſtock will more readily unite, being more replete with juices than in hot dry weather, when the ſtock will perſpire ſo faſt, as to leave the buds deſtitute of moiſture.

INOM, or *Innom barley*, ſuch barley as is ſown the ſecond crop after the ground is fallowed.

INSECT, a general name for the ſmaller kinds of animals.

With regard to the generation of inſects, the world is now in general convinced, that they are not bred from corruption, but from eggs, though the contrary was believed by the ancients.

Malpighi, Swammerdam, and Redi, have abundantly confuted the doctrine of equivocal generation, as well as the chimerical transformation of the caterpillar into the butterfly, and have ſhewn, that all the members of the butterfly were incloſed under the nympha or ſkin of the caterpillar, as the parts of a plant are in the ſeed.

Inſects take particular care to depoſit their eggs or ſemen in ſuch places where they may have a ſufficient incubation, and where the young, when hatched, may have proper food till they can ſhift for themſelves. Thoſe whoſe food is in the water, lay their eggs there; thoſe to whom fleſh is a proper food, in fleſh; and thoſe to whom the fruits or leaves of vegetables are food, are accordingly depoſited there, but conſtantly the ſame kind in the ſame tree. As for others that require a greater degree of warmth, they are provided by the parent with ſome place in or about the body of other animals, as the feathers of birds, hair of beaſts, ſcales of fiſh, in the noſe, in the fleſh, nay ſome in the bowels of man, and other creatures. And as for others, they make them neſts, by digging into the earth, wood, &c. carrying in and ſealing up proviſions that ſerve for the production of their young, and for their food when produced.

There is obſerved in flies, butterflies, &c. a kind of glue, by which the female faſtens her eggs to the beraing buds of trees, &c. ſo as not to be hurt by rain or froſt.

Mr. Andry, in his Treatiſe *De la Generation des vers dans le Corps de l'Homme*, takes notice, that the ancients were miſtaken in denying that inſects breathed, on account of their wanting lungs; for modern obſervations convince us, that inſects have a greater number of lungs than any other animals. They alſo thought that they had no blood, as many of them had no red liquor like ours; but it is not the colour, but the uſe of the liquor, that is to be regarded. They alſo believed that they had no hearts; whereas our microſcopes now diſcover that, when inſects have ſeveral lungs, they have alſo ſeveral hearts; and this in particular is obſervable in ſilk-worms, who have a continued chain of hearts from the head almoſt to the extremity of the tail; and, as is apparent from ſeveral inſects, who give ſigns of life, long after they are divided into ſeveral parts.

Inſects want no parts that are either neceſſary or convenient for their uſe, or to render them complete in their kind. Some affirm that earth-worms, and thoſe round-tailed worms, which are found in the inteſtines of men, horſes, &c. as alſo ſnails and horſe-leeches, are hermaphrodites; but that ſuch worms as become flies, and that ſilk-worms, are not ſo, being of no ſex, but neſts full of real animals, which in time come out with wings.

Several ſorts of inſects do irreparable injury to the huſbandman, though ſo very minute as hardly to be diſcovered.

Among others, a ſmall kind of worm gets into the roots, chiefly of oats, and, working upward, deſtroys all the inſide of the plant, which periſhes ſoon after. M. Duhamel ſuſpects it to have been an inſect of this kind that deſtroyed vaſt quantities of wheat in the neighbourhood of Geneva, and of which M. de Chateauvieux ſent him the following account. "Our wheat, ſays that illuſtrious huſbandman, in the month of May 1755, ſuſtained a loſs which even that cultivated according to the New Huſbandry did not eſcape. We found in it many little white worms, which afterwards became of a cheſnut colour. They poſt themſelves between the blades, and eat the ſtems. They are uſually found between the firſt joint and the roots. Every ſtalk which they attacked, grew no more, but became yellow and withered. The ſame misfortune befel us in the year 1732. Theſe inſects appeared about the middle of May, and made ſuch havock that the crop was almoſt deſtroyed."

Mr. Liſle mentions, that on the 13th and 14th of June, in pulling up wheat in ear, and ſow-thiſtles, he obſerved among the upper part of the roots of moſt of theſe plants, knots or cluſters of graſs-lice, or green locuſts, as he calls them, which appeared whitiſh when they were but juſt come to their ſhape, and as yet under ground: and among moſt of theſe cluſters he obſerved a fly at her incubation, very turgid of a whitiſh matter; ſhe being then blowing theſe inſects. Her wings were black, and he thought her plainly the ſame as the locuſt, excepting that it had wings. He did not find more than one fly at any one root.

We too often find, in our kitchen-gardens, a ſort of vermin called vine-fretters. They fix upon the roots of leguminous plants, which afterwards gradually turn yellow, and die. M. Tillet ſays he has obſerved the ſame inſect in the roots of wheat.

The cuckow-ſpit, or ſpring-forth, as it is commonly termed, lodges itſelf principally in the joints of plants, ſeldom appears before the latter end of May, and is moſt common when rain has fallen after a ſeries of dry weather. M. Poupart, in his account of this little creature, ſays, that as ſoon as it is out of its egg, it goes to a plant, which it touches with its fundament, and faſtens there a white drop of liquor full of air; that it drops a ſecond near the firſt, then a third, and ſo on till it covers itſelf all over with a ſcum or froth, which keeps it from the heat of the ſun, or ſpiders that would ſuck it. But Mr. Liſle takes this liquid to be nothing but the nightly dew, which falls on the fork or joint of the plant, where the

little

little insect works it into froth with its proboscis, as with a bellows. *See the article* BUTTERFLY.

INSTEP, a name given to that part of a horse's leg, which reaches from the ham to the pastern-joint.

INUNDATION, a flood, or the overflowing of lands by a large collection of water. For the manner of guarding against the bad effects of inundations, *see the article* BANKS.

JUG, a large drinking vessel, with a gibbous or swelling belly.

JURNET, earth-nut.

K.

KEEVE, a fat in which beer is worked or fermented.

KELL, a web, or kind of bag, in which insects are bred.

KID, a small faggot of under or brush-wood.

KIDEROW, a place for keeping a sucking calf.

KIDNEYS, two pretty large glandulous bodies situated in the cavity of a horse's loins upon the two lowermost ribs.

Their use is to separate the urine, which is of great importance to the health and preservation of horses, they being liable to many diseases, which either take their origin from faulty kidneys, or have at least such symptoms, as plainly shew the kidneys to be more or less affected.

The signs of the kidneys being hurt or affected, are a weakness of the back and loins, difficulty of staling, faintness, loss of appetite, and deadness in the eyes; the urine is thick, foul, and sometimes bloody, especially after a violent strain. A horse diseased in his kidney can seldom back, that is, move strait backwards, without pain, which is visible as often as he is put to the trial: the same thing is observable indeed in horses, whose backs have been wrang and wrenched, but with this difference, that in the latter there is seldom any defect or alteration in the urine, except that it is higher coloured.

Bleeding is the prime remedy, and that plentifully, in order to prevent inflammation; and the more so, if a fever attends a difficulty in staling, for then we may suspect the kidneys already inflamed. A rowel in the belly has been found useful, and the following balls may be given twice or thrice a day, with a pint of marshmallow decoction, in which half an ounce of gum-arabic is dissolved, with an ounce of honey.

> Take lucatellus balsam one ounce, spermaceti six drams, sal prunellæ half an ounce; mix into a ball with honey: if the urine is bloody, add half an ounce of Japan earth.

Should the fever continue, bleed largely, give emollient clysters, and the cooling, opening drink, till it abates.

If the urine passes with difficulty and pain, notwithstand these means, give this ball, and repeat it twice or thrice a day, till the horse stales freer and without pain, his urine becomes of a right consistence, and is free from any purulent settlement.

> Take balsam of copivi, or Strasbourg turpentine, and Venice soap, of each one ounce; nitre six drams, myrrh powdered two drams; make into a ball with honey, and wash it down with the marshmallow decoction.

But if this method should not be succesful, and the urine continues turbid, grows coffee coloured or fœtid, the horse losing his appetite and flesh, it is a sure sign of ulceration in the kidney; which if the above remedies do not soon remove, you may depend on it the horse will go into a consumption, and is incurable.

As a suppression of urine arises sometimes from an inflammation of the kidney; so at others, from a paralytic disorder, disabling them in their office of separating the urine from the blood: in this latter case the bladder is usually empty, so that a horse will make no motions to stale, and if he continues a few days in this condition, his body will swell to a great degree, breaking out in blotches all over, and death will soon close the scene.

If it arises from inflammation, bleed largely, and treat the horse as above recommended; but if not, give stimulating clysters, and strong diuretics, such as the following balls once in four hours; for if a horse stales not in thirty hours, his danger must be great.

> Take juniper-berries powdered one ounce, sal prunellæ six drams, ætherial oil of turpentine half an ounce, camphor one dram, oil of juniper two drams; make into a ball with honey, and give after it, three or four horns of the marshmallow decoction and honey.

Or,

> Take squills powdered two or three drams, nitre half an ounce, or six drams; make into a ball with honey.

Or,

The following, which is more forcing, and should be given with caution.

> Take cantharides well dried, from one scruple to half a dram; camphor dissolved in oil of almonds, from one dram to two; nitre and Venice soap, of each an ounce; mix into a ball with syrup of marshmallows.

When

When this last ball is given, the horse should be made to drink plenty of water, with gum-arabic dissolved in it; the following clyster may also be given at the same time.

> Take of Barbadoes aloes two ounces, the same quantity of Venice turpentine, beat up with the yolks of two eggs; jallap powdered two drams; juniper and bay-berries, each a handful, bruised and boiled in two quarts of a decoction of mallows; strain off and mix by degrees with the above, to which add a pint of linseed-oil.

If the complaint is not removed by these means, rub the horse's reins well with two parts of oil of turpentine, and one of oil of amber; and apply a poultice of garlick, horse-radish, mustard-seed, camphor, and green soap, spread on thick cloth, over them. Give the horse also two drams of calomel over night, and a moderate purge the next morning. These, perhaps, are the chief and best remedies that can be given in this generally fatal disorder.

When the stranguty in a horse does not arise from wind, or dung pressing on the neck of the bladder, the cause is from inflammation, or too long a retention of the urine. Such horses make frequent motions to stale, stand wide and straddling, are full, and have their flanks distended. In this case bleed largely; give the following drink, and repeat it every two hours, for two or three times, till the horse is relieved.

> Take Venice turpentine broke with the yolk of an egg one ounce, nitre or sal prunellæ six drams, half a pint of sweet oil, and a pint of white wine.

If this drink should not have the desired effect, the diuretic ball above-mentioned may be given in the same manner, omitting the myrrh.

Give the horse plenty of the marshmallow decoction, in a quart of which dissolve an ounce of nitre and gum-arabic, and two of honey.

Horses subject to a diabetes, or profuse staling, if old, or of weak constitution, are seldom cured; they soon loose their flesh and appetite, grow feeble, their coat staring, and they die rotten. Of a young horse there are more hopes; but he must not be indulged with too much water, or moist food. Give him the following:

> Take jesuits-bark four ounces, bistort and tormentil-root, of each two ounces; boil in two gallons of lime-water to the consumption of half, and give a pint three times a day.

Let the horse drink two or three quarts a day of lime-water; and if these medicines should not succeed, give a quart of strong allum posset, three or four times a day.

This method is proper also for a horse who stales blood; or the following balls may be given for that purpose, if the bleeding is profuse.

> Take bole-armoniac one ounce, Japan earth half an ounce, roch-allum two drams, elixir of vitriol one dram; make into a ball with conserve of roses, and give it every six hours.

As this disorder generally proceeds from too violent exercise, over-straining, &c. repeated bleedings in small quantities are absolutely necessary, till the mouths of the vessels close up. *Bartlet's Farriery, pag.* 159.

KILN, a kind of stove for admitting heat, in order to dry any substance, as malt, hops, &c. *See the articles* MALT *and* HOPS.

KILN also signifies a fabric constructed for burning lime-stone, chalk, &c. into lime.

The kiln commonly used for this purpose is a large pit, generally round, and of a size proportioned to the quantities intended to be burnt. It is widest at the top, and narrower, by degrees, as it comes nearer the bottom. The inside of this pit is sometimes lined with a wall built of lime-stone; but more commonly, and more properly with bricks: at the outside, near the bottom, is a hole, or door, by which the ashes are taken out; and above that, some have an iron-grate, which comes close to the wall round about: but others make an arch with stone, or large pieces of chalk; and upon this they lay a layer of stone, or of whatever else they burn in the kiln; upon this they place a layer of fuel, and so on, layer over layer, till the kiln is full; only observing that the outermost layer be always of the fuel, and not of chalk or stone. When the kiln is thus filled, fire is given at the hole underneath; and the lime is finished in a different time, according to the nature of the substance. That made of chalk is generally burnt in twenty-four hours; but stone often requires sixty hours. Ten bushels of sea-coal, or one hundred of faggots three feet long, will burn forty bushels of chalk, which will yield thirty bushels of unslaked lime. Where chalk is scarce, the chalk rubbish is often worked up into a kind of paste, with water, and made into a sort of bricks, which are dried in the air, and then burnt into lime in the common way: but this is not quite so good as that which is burnt from the chalk-stone.

The experience of late years has shewn that it is more profitable to burn lime in kilns shaped like a hogshead; that is, small in circumference at the bottom, gradually wider towards the middle, and then contracting again upwards to the top. This kiln, as Mr. Lummis observes in his letter to the Edinburgh Society, published by Mr. Maxwell, should be made entirely within the surface of the ground, on the declivity of a little hill, where that situation can be had, so as to allow free accesss to the air-hole or furnace. At the bottom, about a foot from the ground, are iron-bars, placed horizontally arofs, to give the kiln a good draught, and upon these bars are laid, first small wood or furze, then small coals, then stones about the bigness of an egg, then another layer of fuel, and so on, increasing the size of the stones towards the middle of the kiln, where they may be as big as half a peck, and decreasing their size gradually up to the top, observing to lay the smallest nearest to the sides. The stones need not be broken so small for this kiln, as for those above ground; they will be burnt more truly without raw stones, or running into cinders; and not above half the quantity of fuel consumed in the common way, will be used in this.

The following method of constructing another kiln, is thus particularly described in Mr. Maxwell's Collection.

At bottom, the kiln must be three feet four inches wide; and at the height of two feet four inches, three feet six inches. At the depth of four feet and a half, it must be four feet and a half wide. A second slope is then made five feet and a half higher, at the end of which, the kiln, then ten feet deep, should be exactly ten feet wide within the walls. A third slope should heighten it to 14 feet, where it should be exactly 12 feet and a half wide, likewise, within the walls From thence it is run up to the height of nineteen feet, when it should be rather less than fifteen feet wide. The slopes must be made as gradual as possible, and the inner surface of the kiln must be quite smooth, that its contents may fall down equally when the burnt stones are drawn out below. By extending a line from a pole fixed in the center of the bottom or floor of the kiln, to the sides, workmen will easily be guided in making the above-mentioned slopes. This kiln has four vents, opposite to one another, and no cross-irons whereupon to lay the coals and stones, they being supported by old timber, furze, broom, &c. above which the coals are laid: but if the kiln be built on the side of a hill, it can have but three vents. The first layer of stones above the vents should be closely jambed in, and rest against the sides of the wall. A kiln of the above dimensions will burn eighty bushels of lime-stones in a day: but it may be made larger, without altering these dimensions, by only adding two or three feet to the height, which will require strong walls. This addition to the height need not be sloped, but may be made perpendicular.

The late earl of Stair had a kiln at New Liston, and others in Galloway, built in the shape of an egg, opened a little at both ends, and set upon the smallest. This kiln answered exceedingly well, and besides lime-stone, burnt any kind of earth that was thrown into it.

Kilns thus built, swelling at or about the middle, and contracting again at the top, reverberate more strongly, and make a more intense heat, than those which grow wider and wider, and are not contracted.

When the kiln is filled, or finished as it is commonly termed, it should be covered over with sods or strong turf, to keep the heat as intense as possible, and hinder the wind from blowing the fire at the top, or rain from abating or extinguishing it. The stones must be broken in pieces before they are thrown into the kiln; otherwife the air contained in their cavities, being expanded by the heat, will often make them fly with fuch violence as to damage the kiln. For this reafon they fhould be broken fmaller for kilns that are above ground, than for thofe which are underneath. The faving of this labour, and of near half the quantity of fuel, renders thefe laft greatly preferable.

Lime is made of chalk, or of any ftone that is not too cold, or fandy, as free-ftone and the like. All the foft ftones that are of a tolerably clofe texture, will burn to good lime, as will alfo marble, flate, fea-fhells, corals, and flints; but this laft kind of ftone is more difficult to be burnt into lime than the others, except in a reverberatory kiln, becaufe it is apt to run to glafs. The hardeft, firmeft, and whiteft ftones make the beft lime; and when it is made of chalk, that which is formed of the hardeft, ftony kind, is much better than that which is made from the foft; but the harder the ftones are, the more fire it requires to burn them. Both forts may be burnt with wood, coals, turf, furze, or fern, which make a very fierce fire.

Thefe kilns feem to be intended for burning only one kiln full at a time: but where large quantities of lime are wanted, perpetual kilns, that is, kilns where the fire is kept conftantly burning, are conftructed on nearly the fame principles. Here the iron bars at the bottom are abfolutely neceffary, in order to take out the lime as foon as it is burnt. When ftone-lime, which requires the moft violent fire, is burnt in thefe kilns, vents are made near the bottom to be opened occafionally, according as the wind fits, that a ftronger current of air may quicken the fire, and thereby give it the more power. *See the article* LIME.

KILN-ASHES, the afhes made in kilns where wood, ftaw, furz, &c. are burnt. Thefe afhes are a good manure for almoft any kind of foil. In the weft of England, the farmers fift them over their corn and grafs; but this muft not be done in windy weather, becaufe they are fo very light, that they would eafily be blown away. They fucceed beft when laid on juft before rain or fnow.

KINNEL, a powdering-tub.

KIT, a milking-pail, in the form of a churn, with two ears and a cover.

KNAPWEED, the fame with blue-bottle. *See* BLUE-BOTTLE.

KNOT-GRASS, the fame with couch-grafs. *See* COUCH-GRASS.

KNOLL, a little round hill.

KNOLLS, a term ufed in fome counties of England to fignify turneps.

L.

LACTARY, a milk-houfe.

LADIES-SMOCK, *Cuckow-flower*, or *Canterbury-bells*, a perennial weed, and common in pafture grounds. The ftalk is upright, round, and fmooth. The leaves are winged, with the lobes of the lower ones roundifh, and of thofe on the ftalk oblong. The flowers are large, handfome, and white, or purplifh, confifting of four obtufe veined petals. The feeds are contained in erect compreffed pods, about an inch in length, divided into two cells, which, when ripe, burft with a touch, and throw out their feeds to a confiderable diftance.

LAIRE. *See* LAYER.

LAMB, the young of the fheep-kind. *See the article* SHEEP.

LAMENESS, in horfes. *See the article* STRAINS.

LAMPAS, an excrefcence in the roof of a horfe's mouth, which is fometimes fo luxuriant, that it grows about the teeth, and hinders his feeding.

The cure confifts in lightly cauterizing the flefh with a hot iron, taking care that it does not penetrate too deep, fo as to fcale off the thin bone that lies under the upper bars; the part may then be anointed with burnt allum and honey, which is proper for moft fores in the mouth. *Bartlet's Farriery, page* 282.

LAND. *See the article* GROUND *and* SOIL.

LARCH-TREE, a genus of trees, whofe leaves, which are long and narrow, are produced out of little tubercles, in form of a painter's pencil: the cones are produced at remote diftances from the male flowers on the fame tree: the male flowers are very like fmall cones at their firft appearance, but afterwards ftretched out in length.

Thefe trees are propagated by feeds, which fhould be fown in the beginning of March, upon a bed of light foil, expofed only to the morning fun: or otherwife they may be fown in pots or boxes of light earth, and placed near a hedge, where they may have the morning fun only. The feed fhould be covered about half an inch thick with fine light earth, and in very dry weather fhould be gently refrefhed with water. In about fix weeks, if your feeds were good, your plants will come up, at which time you fhould carefully guard them againft the rapacious birds, which would otherwife pull off the heads of the plants, as they thruft themfelves out of the ground with their covers on them: and obſerve to refreſh them with water in dry weather, eſpecially if they are ſown in pots or boxes; as alſo to keep them clear from weeds, which, if ſuffered to grow among the young plants, will ſoon deſtroy them: nor ſhould they be too much expoſed to the ſun, or ſtrong winds, both which are very injurious to theſe plants while they are young: but in October you ſhould, if they are in boxes or pots, remove them into a ſituation where they may be defended from ſharp winds, which are ſometimes hurtful to them, while young; but afterwards, they will indure the ſevereſt weather of our climate.

Theſe trees are very proper for the ſides of barren hills, where few other ſorts will thrive ſo well; nor is this tree very delicate in its ſoil, but will grow much better on poor, ſtrong, ſtony land, than in rich ground; and, during the ſummer, they appear very beautiful; but in autumn they caſt their leaves, whereby ſome people have been deceived, by ſuppoſing them dead, and have deſtroyed them.

From the wounded bark of this tree exudes the pureſt Venice turpentine; and on the body and branches of it grows the agaric, which is a drug uſed in medicine.

LARKSPUR, a genus of plants, whoſe flower conſiſts of five unequal petals, diſpoſed circularly: of theſe the upper one is anteriorly more obtuſe than the others, and is emarginated, and extended behind into a tubulated horn, which is ſtraight, long, and obtuſe. The two ſide petals are nearly of the ſize with the upper; and the two lower are leſs, and ſpread open. The ſtamina are numerous; and the fruit conſiſts of three capſules, of an ovate-ſubulated figure, joined together, which are filled with a number of angulated ſeeds.

There are ſeveral ſpecies of larkſpur; but the ſort which is well known, and common in gardens (particularly thoſe with double flowers of various colours) is much in eſteem, and extremely beautiful.

Theſe are annual, and may be ſown in autumn or ſpring. Where the land is light and dry, the autumn ſowing is to be preferred; for if the plants withſtand the ſeverity of winter, they blow much earlier than thoſe ſown in the ſpring, and their ſpikes of flowers are conſiderably larger. In order to continue their plenitude, all plants with ſingle flowers ſhould be deſtroyed ſo ſoon as they appear, reſerving for ſeed thoſe only which are very double.

They flower in July and Auguſt, and are great ornaments to the pleaſure garden.

LATH, a long, thin, and narrow ſlip of wood, nailed to the rafters of a roof or cieling, in order to ſuſtain the covering.

Theſe are diſtinguiſhed into three kinds, according to the different kinds of wood of which they are made, viz. heart of oak, ſap laths, and deal laths; of which the two laſt are uſed for ceilings and partitions, and the firſt for tiling only.

Laths are alſo diſtinguiſhed according to their length, into five feet, four feet, and three feet laths; though the ſtatute allows but of two lengths, thoſe of five, and thoſe of three feet, each of which ought to be an inch and a half in breadth, and half an inch in thickneſs; but they are commonly leſs.

Lath-Bricks, bricks much longer than ordinary, uſed inſtead of laths, for drying malt; for which purpoſe they are extremely proper, as not being liable to catch fire, and retaining the heat much longer than thoſe of wood; ſo that a very ſmall fire will ſerve after they are once heated.

LATHE, a word uſed in ſome counties in England, to ſignify a barn.

LAVENDER, a well known plant cultivated in moſt gardens, and of which there are two ſorts, diſtinguiſhed by the names of lavender ſpike, and common narrow leaved lavender. They are both propagated by cuttings or ſlips of a year's growth. Theſe ſhould be planted in March, in a ſhady ſituation, or at leaſt they ſhould be ſhaded with mats till they have taken root. They may then be expoſed to the ſun; and after they have acquired ſufficient ſtrength, they ſhould be removed to the places where they are to remain. The broad lavender does not often produce flowers; but when it does, they appear towards the latter end of July, at which time the ſpikes of the common ſort, which bloſſom the earlier of the two, and which is the kind cultivated for medicinal uſes, are fit to be gathered. Both theſe ſorts will grow beſt in the ſummer, if planted in a rich and moiſt ſoil; but then they ſeldom bear the inclemency of the winter: nor will they have half ſo ſtrong an aromatic ſcent, nor laſt near ſo long, as thoſe ſituated on a dry, gravelly, or ſtony ſoil. In ſuch land, or even on a barren rocky ſpot, they will reſiſt all the ſeverity of our hardeſt winters.

LAWN, a large plain in a park, or adjoining to ſome grand ſeat. The moſt convenient ſituation is on the ſouth, or ſouth-eaſt-ſide of the houſe. If the lawn be a ſquare, three avenues may break out from three of the angles, and meet in the fourth angle oppoſite to the houſe: it may be bounded with walks or a ſingle row of lime trees, ſet at a good diſtance from one another. A circle is a good figure for a lawn, but muſt break off before it comes againſt the front. A triangle is a very proper figure, but ſhould be obtuſe or right-angled next the front.

Many perſons have preferred the lime-tree for this purpoſe, on account of their regular growth: but as the leaves of this tree often change their colour, and begin to fall very ſoon in the autumn, occaſioning a great litter in the garden; and from the end of July the trees make but an indifferent appearance, ſo they are not to be eſteemed for theſe plantations.

The elm, oak, beech, and cheſnut, among the deciduous trees, are to be preferred to all others, as they keep their leaves late in autum: and theſe are all of them large growing trees; ſo are very proper for this purpoſe.

If there are ſome clumps of ever-green trees intermixed with the deciduous trees in this plantation, it will add to the beauty of it, eſpecially in the winter ſeaſon: the beſt ſorts for this purpoſe, are the lord Weymouth's pine, the ſilver and ſpruce firs, which will grow faſt, and become large trees; and as the two latter ſorts always grow pyramidically, ſo they will have a good effect to the ſight, when properly diſpoſed with the diciduous trees: but as theſe generally feather out their branches near the ground, they ſhould be planted where they do not obſtruct the view of any diſtant objects.

But as moſt perſons who take pleaſure in beautifying their ſeats in the country, are in haſte for ſhade, they generally plant the trees too cloſe together, and often in ſuch a manner, as to render it difficult, when the trees are advanced, to reduce their number, without injury to the deſign: therefore thoſe trees ſhould be firſt planted, which are deſigned to remain; and then there may be ſome few others planted for preſent ſhade, which may afterwards be taken away. When perſons, who are beautifying their ſeats, meet with full grown trees on the ſpot, it is a great pleaſure; for theſe ſhould not be deſtroyed, if they can poſſibly ſtand. *Miller's Gard. Dict.*

LAYERS, the ſmall tender ſhoots or twigs of trees, laid or buried in the ground, till having ſtruck root, they are ſeparated from the parent-tree, and become diſtinct plants. The manner of performing this operation is as follows:

1. Take ſome of the boughs, and lay them into the ground, about half a foot deep, in fine freſh mould, leaving them with the end of the layer, about a foot, or a foot and a half out of the ground, and keep them moiſt during the ſummer-ſeaſon, and they will probably have taken, and be fit to remove in autumn; and if they have not by that time taken root, they muſt lie longer.

2. Tie a piece of wire hard round the bark of the bough, at the place you intend to lay in the ground; and twiſt the ends of the wire, ſo that they may not unite; and prick the place above the wire, through the bark, with an awl in ſeveral places; and then lay it in the ground, as before directed.

3. Cut a ſlit upwards at a joint, as is practiſed in laying of carnations, which, by gardeners, is called tonguing the layers.

4. Twiſt the place which you deſign to lay in the ground like a withy, and lay it into the ground, as directed in the firſt way of laying.

5. Cut a place round about the bough that is deſigned to be laid, an inch or two, at the place that is moſt convenient to lay into the ground, and manage it as is directed in the firſt method of laying.

The

The feafon for laying hardy trees that fhed their leaves, is in October; but for fuch as are tender in March; for ever-greens, June or Auguft are good feafons.

Though layers may be laid at any time in the year, the before-mentioned feafons are moft proper, for the reafons following; becaufe they have the whole winter and fummer to prepare and draw root; for at thefe times of the year, the fun has fufficient power on the fap of the tree to feed the leaf and bud, but has not power fufficient to make a fhoot.

And if that fmall quantity of fap that does arife be hindered, as it will by fome of the preceding ways of laying, the leaves and buds will gently crave of the layer, and by that means will prepare the layer to take root, or put forth roots a little to maintain itfelf, finding it cannot have it from the mother-plant.

And therefore becaufe it wants but little nourifhment at that time of the year, it is better to lay layers of trees, or to fet cuttings, than at other times, either in the winter, when the fap ftirs but little, or in the fummer, when the fap abounds, or in the fpring, when it begins to rife; becaufe it is then apt to come too fuddenly to draw fap from the layer, before the layer has drawn or prepared for root.

However, the fpring or fummer may do well for fmall plants; becaufe fuch plants, being but fhort-lived, draw root the quicker.

If you would lay young trees from an high ftandard, the boughs of which cannot be bent down to the ground, then you muft make ufe of ofier-bafkets, boxes, or pots, filled with fine fifted mould, mixed with a little rotten willow-duft, which will keep moifture to affift the layer in taking root: this bafket, box, &c. muft be fet upon a poft or treffel, &c. and the bough muft be laid according to either of the four firft ways of laying; but too much head muft not be left on, left that be injured by the wind, or by its own motion rub off the tender root; and the fmaller the boughs are, the lefs way they fhould be fet out of the ground, and care muft be taken to keep them clear from weeds.

The harder the wood is, the better will the young wood take root; but if the wood be foft, the older boughs will take root the beft. *Miller's Gard. Dict.*

LEAF, a part of a plant, commonly very thin and flat, growing in the fpring, and falling off in the autumn.

Leaves are the ornament of the twigs, and confift of a very glutinous matter, being furnifhed every where with veins and nerves. Their office is to fubtilize the nourifhing fap, and convey it to the little buds; and likewife they ferve to cover the flowers and fruits with their fhade, and keep them from other inconveniences; they are to trees what hair is to the human body.

Dr. Grew obferves, that the fibres of leaves confift of two general kinds of veffels, namely, for fap and for air; and are ramified out of greater into lefs, as veins and arteries are in animals.

Mr. Frederick, of Augfbourg, a celebrated gardener, took from the tree a leaf of the opuntia or Indian fig-tree; and fetting it in the earth, it immediately took root, and produced bloffoms and fruit.

The diftinction of leaves, made by thofe who have written on botany, are the following.

A fimple leaf is that which is not divided to the middle.

A compound leaf is divided into feveral parts, each refembling a fimple leaf, as in liquorice, &c.

A digitated leaf is a compound leaf divided into feveral parts, all of which meet together at the tail, as in the hemp, black hellebore, &c.

A trifoliated leaf is a digitated leaf, confifting of three fingers, as the trefoil, &c.

A quinquefoliated leaf is a digitated leaf, confifting of five fingers, as in the quinquefolium.

A pennated leaf is a compound leaf divided into feveral parts, each of which is called a lobe, placed along the middle rib, either alternately, or by pairs. When the middle rib is terminated by an odd lobe, it is faid to be unequally pennated, as in the goats rue, &c. and equally pennated, when it is not terminated by an odd lobe, as in the caffia; when the lobes are all nearly of the fame form and bignefs, it is called an uniform pennated leaf, as in the liquorice; when they are not fo, it is faid to be difform, as in the agrimonia.

A winged leaf is, as it were, divided into feveral pennated leaves, as in the orobus, &c.

A ramofe leaf is that which is ftill farther divided than the winged leaf, as in the ofmund royal, female fern, &c.

An entire leaf or lobe is that which has no divifion on its edges, as in the apple-tree, &c.

A finuated leaf is that which is cut about the edges into feveral long fegments, as in common mallows.

A ferrated leaf is that which is cut about the edges into feveral acute fegments, refembling the teeth of a faw, as in the nettle, &c.

A crenated leaf is that which is cut about the edges into feveral obtufe fegments, as in the betony, &c.

A lacinated or jagged leaf is that which is cut about the edges into feveral pretty deep portions, in an irregular manner, as in the horned poppy, &c.

If the furface of leaves are altered, by reverfing the branches of trees on which they grow, the plants are ftopped in their growth, until the footftalks are turned, and the leaves recover their former pofition. This fhews how neceffary it is to fupport all thofe weak fhoots of plants, which are naturally difpofed for upright growth, which either twine about the neighbouring trees for fupport, or that put out clafpers, by which they take hold of whatever trees or plants grow near them, and are thereby fupported; and, on the contrary, how abfurd is that practice of tying up the fhoots of thofe plants which are naturally difpofed to trail upon the ground, for in both thefe cafes nature is reverfed, and confequently the growth of both forts of plants is greatly retarded.

This is one of the great functions for which the leaves of trees and plants are defigned; but, befides this, there are others of equal importance to the well-being of plants and fruits; the firft is, that of the footftalks and leaves nourifhing and preparing the buds of the future fhoots, which are always formed at the bafe of thofe footftalks, and during the continuance of the leaves in perfect health, thefe buds increafe in their magnitude; and, in the deciduous trees, are brought to maturity before the footftalks feparate from the buds in autumn; but if by accident the leaves are blighted, or if the entire furface of the leaves are cut off, and the footftalks are left remaining, the buds will decay for want of that proper nourifhment which is conveyed to them from the leaves; fo that whenever trees are divefted of their leaves, or thofe leaves are cut, or otherwife impaired, though it may in either cafe happen when the buds may be nearly formed, yet if it is before the footftalks feparate naturally from their branches, the future fhoots will be weakened in proportion to the time when this is done; therefore from all the experiments which have been made in order to know how ferviceable the leaves of trees and plants are to their well-being, it has been found, that when the plants have been divefted of their leaves, or their leaves have been eaten or cut, during their growth, the plants have been remarkably weakened thereby. This fhould teach us not to pull or cut off the leaves of trees, or plants, on any account, while they retain their verdure, and are in health; and this fhews how abfurd that common practice is, of feeding down wheat in the winter and fpring with fheep; for by fo doing, the ftalks are rendered very weak, and the ears are in proportion fhorter; nor are the grains of corn fo plump and well nourifhed, as that which is not fed down upon the fame ground: this is a fact which we can affert from many years experience. It is very evident, that grafs which is often mowed, the blades will be rendered finer in proportion to the frequency of mowing it, yet the fpecies of grafs is the fame with that on the richeft paftures; fo that although this may be a defirable thing for lawns, &c. in gardens, yet where regard is had to the produce, this fhould be avoided.

Another principal ufe of the leaves, is to throw off by tranfpiration what is unneceffary to the growth of the plants, anfwering to the difcharge made by fweat in animal bodies; for as plants receive and tranfpire much more, in equal time, than large animals, fo it appears how neceffary the leaves are to preferve the plants in in perfect health; for it has been found by the most exact calculation, made from repeated experiments, that a plant of the sun-flower receives and perspires, in twenty-four hours, seventeen times more than a man.

We shall beg leave to mention a few, out of the many experiments which have been made by M. Bonnet, of Geneva, to prove that most leaves imbibed the moisture of the air on their under surface, and not from their upper; they are as follows:

He gathered the leaves of sixteen sorts of herbaceous plants when fully grown; of each he put several leaves upon the surface of water in glass vases, some were posited with their upper surface, and others with their under surface upon the water; these were adjusted exactly to the surface of the water, with great care not to let any moisture reach their opposite surfaces, and the same care was taken to prevent their footstalks from receiving any moisture. The glasses in which these leaves were thus placed, were kept in a closet, where the air was very temperate; and as the water in the glasses evaporated, there was, from time to time, a supply of fresh, which was added with a syringe, so that the leaves were not disturbed. The leaves were taken from the following plants; the plantain, the mullein, the wake Robin, the great mallow, the nettle, the marvel of Peru, the kidney-bean, the sun-flower, the cabbage, the baum, the cock's-comb, the purple leaved amaranth, spinach, and the smaller mallow.

Six of these sorts he found continued green a long time, and these were with different surfaces upon the water: they were of the following sorts, the wake Robin, the kidney-bean, the sun-flower, the cabbage, the spinach, and the small mallow; among the others, the following sorts were found to draw the moisture better with their upper than with their under surface, the plantain, the mullein, the great mallow, the nettle, the cock's-comb, and the purple amaranth.

The leaves of the nettle, whose under surfaces were placed upon the water, were decayed in three weeks; whereas those whose upper surfaces touched the water, lasted three weeks.

The leaves of the mullein, whose under surfaces were next the water, did not continue fresh more than five or six days; whereas those whose upper surfaces were next the water, lasted five weeks.

The leaves of the purple amaranth, whose upper surfaces were next the water, continued fresh three months; whereas those whose under surfaces touched the fluid, were decayed in a week.

The leaves of the marvel of Peru and the baum, appeared to have the advantage, whose under surfaces were next the water.

The leaves of the wake Robin, and of the cock's-comb, whose footstalks only were put into the water, continued fresh a longer time than those which were placed with either surface upon the water.

The leaves of the great mallow, the nettle, the sun-flower, the marvel of Peru, and the spinach, whose footstalks were plunged into the water, continued fresh a shorter time, than those which had either of their surfaces upon the water.

The leaves of the mullein, plantain, and amaranth, which received the water at their footstalks, continued fresh much longer than those whose under surfaces touched the water.

It is not difficult to explain the reason of this fact; for the orifices of the sap-vessels in the footstalks are much larger than those of either surface, so that the water insinuates itself in greater quantities, and with more ease, in the first than by the second way.

After this the same gentleman made experiments on the leaves of sixteen sorts of trees and shrubs, of the following sorts: the lilac, the pear-tree, the vine, the aspin, the laurel, the cherry-tree, the plum-tree, the horse-chesnut, the white mulberry, the lime-tree, the poplar, the apricot, the walnut, the filbert, the oak, and the creeper.

Among these species he found, that the lilac, and the aspin, imbibed the water equally with either their upper or under surface; but in all the other sorts, the under surfaces imbibed it in much greater quantities than the upper. The difference was very remarkable in the leaves of the white mulberry, for those whose upper surfaces were laid upon the water, faded in five days; whereas the others, whose under surfaces were next the water, preserved their verdure near six months.

The vine, the poplar, and the walnut, afforded very remarkable instances, how little disposed the upper surfaces of the leaves of ligneous plants are to imbibe the moisture: for the leaves of these three sorts, whose upper surfaces were applied to the water, decayed almost as soon as those which had no nourishment.

In all the experiments made by this curious gentleman upon the various leaves of trees and herbs, it is remarkable that all those leaves, which imbibed their moisture by their upper surface, were such as had that surface covered over with hairs or down; and, on the contrary, where the under surface was garnished with either hairs or down, the nourishment was imbibed by that surface. He also mentions many experiments made by himself, and also by M. Duhamel de Monceau, of the Royal Academy of Sciences at Paris, in rubbing the leaves over with varnish, oil, wax, and honey, to see the effect of these upon various leaves, some of which were rubbed over on both surfaces, others only upon one; some only a part of the surfaces, others the edges of the leaves were rubbed over, and in some only the footstalks of the leaves. They likewise anointed the trunks of some trees and shrubs, leaving the leaves and branches in their natural state.

The result of these experiments was, that where the leaves were covered with varnish on both sides, they presently decayed; and where they were anointed with other things, the leaves continued a shorter time than others, in proportion as the things were more penetrating; and where one surface only was anointed, they continued much longer than those which were anointed on both; and where the pedicle alone was anointed, they continued still longer: but the anointing of the trunks made no sensible alteration, except in very hot weather; when they were both of opinion the anointing them were of service, by hindering the too great transpiration, which tend to weaken the trees: for they observed, that those trees which were varnished, suffered less from the violent heats, than the trees which were left in their natural state.

M. Bonnet also observed, that the tender parts of the leaves which were varnished were destroyed by it, and the tough fibres only left remaining.

We may therefore reasonably conclude, that one great use of leaves is what has been long suspected by many, viz. to perform, in some measure, the same office for the support of vegetable life, as the lungs of animals do for the support of animal life: plants, very probably, drawing through their leaves some part of their nourishment from the air. *Miller's Gard. Dict.*

LEAP, or *Lip*, half a bushel.

LEASE, *Lea*, *Lay*, or *Ley*, implies grassy ground, meadow ground, or unploughed ground, kept for cattle.

LEASE also signifies the letting of lands, tenements, &c. unto another for life; a term of years, under a reserved rent.

LEEK, the name of a well-known herb, cultivated in every kitchen-garden.

Leeks are raised by sowing their seeds in the spring, in the same manner as onions (*see the article* ONIONS) with which these are commonly sown, the two sorts of seeds being mixed according to the proportion which is desired of either sort, though the most common method is to mix an equal quantity of both; for the onions will greatly out-grow the leeks in the spring; but these being drawn off, the leeks will have time to grow large afterwards, so that there may be a moderate crop of both sorts. Many persons, however, sow their leeks in beds in the spring; and in June, after some of their early crops are taken off, they dig up the ground, and plant their leeks out thereon, in rows a foot apart, and six inches asunder in the rows, observing to water them until they have taken root; after which they will require no farther culture but to keep the ground clear from weeds. The leeks thus planted will grow to a large size, provided the ground be good, and therefore this is a very proper method for those who have but little room.

If you would save the seeds of this plant, you should make choice of some of the largest and best you have, which

which muſt remain in the place where they grow until February, when they ſhould be tranſplanted in a row againſt a warm hedge, pale, or wall, about eight inches aſunder; and when their ſtems advance, they ſhould be ſupported by a ſtring, to prevent their being broken down, to which they are very liable, eſpecially when in head, and the cloſer they are drawn to the fence in autumn, the better the ſeeds will ripen; for it ſometimes happens in cold ſummers or autumns, that thoſe which grow in the open garden, do not perfect their ſeeds in this country, eſpecially if there are ſharp froſts early in the autumn, which will entirely ſpoil the ſeed.

When it is ripe (which may be known by the heads changing brown) you ſhould cut off their heads with about a foot or more of the ſtalk to each, and tie them in bundles containing three or four heads, and hang them up in a dry place, where they may remain till Chriſtmas or after, when you may threſh out the ſeeds for uſe. The huſk of theſe ſeeds is very tough, which renders it difficult to beat out the ſeeds; ſome, therefore, who have but a ſmall quantity, rub it hard againſt a rough tile, which will break the huſks, and get the ſeeds out better than moſt other methods. *Miller's Gard. Dict.*

LEES, the more groſs and ponderous parts of liquors, which, being ſeparated by fermentation, fall to the bottom.

The lees of wine, beer, ale, and oil, are excellent manures.

LEET, a little court held within a manor, and called the king's court, on account that its authority to puniſh offences originally belonged to the crown, and from thence deſcended to inferior perſons.

LEMON, *Limon*, in botany, a genus of trees with large ſtiff leaves like the citron, without any appendage at the bottom; the flower conſiſts of many leaves, which expand in form of a roſe: the fruit is almoſt of an oval figure, and divided into ſeveral cells, in which are lodged hard ſeeds, ſurrounded by a thick fleſhy ſubſtance, which, for the moſt part, is full of an acid juice.

All ſorts are propagated by budding or inarching them either on ſtocks of lemons or citrons produced from ſeeds, but they will not readily unite on orange ſtocks; for which reaſon the citrons are preferable to either oranges or lemons for ſtocks, as they readily join with either ſort; and being of larger growth, cauſe the buds of the other ſorts to be much ſtronger than if they were on ſtocks of their own kind.

The culture of the lemon is the ſame with that of the orange-tree, with this difference only, the former being hardier than the latter, will conſequently bring their fruit to maturity with us much better than the orange will, and therefore require to have a greater ſhare of freſh air in winter; for which reaſon they ſhould always be placed near to the doors or windows of the green-houſe: and in ſome curious gardens theſe trees have been planted againſt walls, where, by covering them with glaſſes in winter, and protecting them from ſevere froſts, they have produced plenty of large fruit: as theſe trees do generally produce ſtronger ſhoots, ſo they require more water to be given them than the orange; but as to the tender ſorts, they muſt be treated with a little more care, otherwiſe their fruit will fall off in winter, and come to nothing. *See* ORANGE.

LENTIL, or *bitter Vetch*, the name of a plant of the vetch or tare kind, cultivated in ſome parts of England as fodder for cattle.

Lentils grow to a foot or a foot and a half high, with ſtalks and leaves like thoſe of tares, but ſmaller; and like them they bear their ſeeds, generally three or four in little pods. Theſe ſeeds are round, hard, ſmooth, and flat, but thicker at the ſides. There are two ſorts of lentils, the white and the yellow; but the latter affords the greater quantity of fodder.

The ſeeds of this plant are commonly ſown in March, where the land is dry, but in moiſt ground the time is in April. The uſual quantity of ſeed allowed to an acre of land is from one buſhel and a half to two buſhels. If theſe are ſown in drills in the ſame manner as peaſe, they will ſucceed better, than when they are ſown broad-caſt. The drills ſhould be a foot and a half aſunder to allow room for the hoe to clean the ground between them; for if the weeds are permitted to grow among them, they will get above the lentils, and ſtarve them. *Miller's Gard. Dict.*

LETTUCE, the name of a well known genus of plants cultivated in kitchen-gardens.

Lettuces of all kinds are multiplied only by their ſeeds, which they produce the firſt year, and then die, if they have not been tranſplanted. The ſorts generally cultivated in the kitchen-garden, are 1. The common or garden lettuce. 2. The cabbage lettuce. 3. The Celicia lettuce. 4. The brown Dutch lettuce. 5. The Aleppo lettuce. 6. The imperial lettuce. 7. The green Capuchin lettuce. 8. The Verſailles, or upright white cos-lettuce. 9. The black cos. 10. The red cos. 11. The red Capuchin lettuce. 12. The Roman lettuce. 13. The prince lettuce. 14. The royal lettuce. 15. The Egyptian cos-lettuce.

The firſt of theſe is moſt commonly ſown for very early uſe, to mix with other ſmall ſallad herbs. It is only a degeneracy of the cabbage lettuce, or the latter an improvement of the former by repeated good culture; for the ſeeds of cabbage lettuces which have not cabbaged cloſely, will produce the former ſort, which gardeners diſtinguiſh particularly by the name of lapped lettuce. Theſe may be ſown at any time of the year, only obſerving to make choice of ſhady borders in hot weather, of warm ſituations in the ſpring and autumn, and to ſow under glaſſes in the winter, becauſe ſevere froſts will kill the young plants.

The cabbage lettuce is likewiſe ſown at ſeveral different times, in order to have a ſupply of it throughout the ſeaſon. The firſt crop of this is generally ſown in February, upon an open warm ſpot of ground. When the plants are come up, they ſhould be thinned to the diſtance of about ten inches aſunder every way, either by hoeing them, if their ſuperfluous numbers be not wanted, or by drawing them up by hand where they ſtand too cloſe, and tranſplanting thoſe which are thus removed into other good mould, likewiſe at the diſtance of about ten inches from each other. If this is done before the plants are too large, they will thrive well; though the tranſplanted ones will ſeldom grow ſo big as thoſe which were not removed: but, in return, they will come ſomewhat later, and thereby anſwer the purpoſe of thoſe who do not repeat this ſowing every fortnight.

In proportion to the advance of the ſeaſon, the ſubſequent crops ſhould be ſown in a more ſhady and moiſt ſituation, but by no means under the drip of trees, leſt the plants ſhould run up to ſeed before they cabbage, eſpecially in the heat of ſummer. The laſt crop of theſe lettuces, which are to ſtand all the winter, ſhould be ſown by the middle of Auguſt, pretty thin, upon a good light ſoil, warmly ſituated; and when the plants are come up, they muſt be well weeded, and thinned, by hoeing, ſo that they may not touch each other. The beginning of October will be a proper time for tranſplanting them into warm borders, where they will reſiſt the winter, if it be not very ſevere: but, to guard againſt its inclemency, and thereby be ſure of a crop, it will be adviſable to tranſplant ſome of this growth into a bed which may be arched over with hoops, and covered with mats, ſtraw or peaſe-haulm, in hard weather. They may be ſet pretty cloſe together; and if they are re-tranſplanted in the ſpring, into a warm and rich ſoil, at the diſtance beforementioned, they will do very well; though they will not cabbage ſo ſoon as thoſe which may have been left un-removed under a warm wall, if theſe laſt eſcape the winter, and if the neceſſary caution has been obſerved, of not placing them too cloſe to the wall; for this ſituation would make them run up in height, and conſequently prevent their growing large or hard.

To have good ſeeds of this ſort of lettuce, the plants ſhould be looked over when they are in perfection, and the largeſt, hardeſt, and loweſt growing of them ſhould be marked out by ſticks thruſt into the ground cloſe to them. All the reſt ſhould be carefully rooted out as ſoon as they begin to run up, leaſt the farina of the flowers of theſe inferior ones ſhould intermix with the others, and thereby occaſion a degeneracy of their ſeeds.

The beginning of February is alſo the firſt ſeaſon for ſowing the Cilicia, the imperial, the ſeveral kinds of cos, and the other ſorts of lettuces above-mentioned: but this early ſowing ſhould be upon a gentle hot-bed covered with a frame. The ſecond ſeaſon for theſe, is the latter end of of February, or beginning of March, upon a border of light earth, and in a warm expoſure, and open ſituation, that is to ſay, in a ſituation not ſhaded by trees. When the plants come up on the hot-bed, plenty of freſh air ſhould be admitted to them, to prevent their being drawn up weak; and when they have got five or ſix leaves, they ſhould be tranſplanted into another hot-bed, to bring them forward: but this laſt need only be arched over with hoops, and covered with mats; for they ſhould not be kept too warm there. When they are removed from thence, and planted out for good, which ſhould be as ſoon as they are ſtrong enough to bear it, they ſhould be ſet ſixteen inches aſunder every way, in a well-looſened ſpot of fine good earth. Thoſe which were ſown in the warm borders ſhould alſo be tranſplanted into a ſimilar ſpot, and ſet at the ſame diſtances as the former. If the ſeaſon is dry, care ſhould be taken to water both the one and the other till they have taken root, and then to keep them conſtantly clear from weeds. This is the only culture that any of them will require, except the black cos lettuces, which ſhould be tied up when they are full grown, to whiten their inner leaves, and render them criſp; for they ſeldom cabbage well without this aſſiſtance.

To continue theſe lettuces through the ſeaſon, other crops of them muſt be ſown in April, May, and June; obſerving, for the reaſons before given, to ſow the lateſt in the moſt ſhady ſituation. Towards the middle or latter end of September, ſhould be the laſt ſowing, and the plants produced thereby ſhould be tranſplanted, either under glaſſes, or into a bed arched over with hoops and covered in the winter, to prevent their being deſtroyed by the froſt: but as much free air as poſſible ſhould be admitted to them when the weather is mild, and they ſhould be covered only in hard rains, or when it freezes; for if they are too cloſely covered they will grow mouldy, and ſoon after rot. In the ſpring, they ſhould be removed into a rich light ſoil, and there ſet at leaſt eighteen inches aſunder every way: for if they are planted too cloſe, they will be apt to run up in height, and not to cabbage well.

This is the crop from which it will generally be moſt proper to ſave the ſeeds of theſe lettuces, if they ſucceed well: though it will be right alſo to mark out ſome of the fineſt plants of the crop ſown in the ſpring; becauſe thoſe of this laſt ſowing may ſometimes fail, through the wetneſs of the ſeaſon, even when they are in full bloom, and the others may do well by having more favourable weather: but if both ſhould ſucceed, there will be no room for complaint, ſince the ſeeds of lettuces will grow perfectly well after they are two years old, and, if they have been ſaved with due care, even at the end of three years. Very great caution ſhould be uſed here, not to let any of the common ſorts ſeed among or near theſe more valuable plants; not only for the reaſons before aſſigned, but becauſe they are naturally the moſt apt to degenerate in this country. The beſt way therefore is to keep the plants of each ſort which are intended for ſeed, as ſeparate as poſſible from all others; and to ſuffer none of them to perfect their ſeeds, except ſuch as are entirely approved of.

The Egyptian green cos, the white cos, the Cilicia, and the red cos, are the moſt valuable of all the ſorts of lettuce cultivated in England. The royal and imperial lettuces are very good; but not ſo generally eſteemed. The white cos uſed to be preferred to all others, till of late years, that the Egyptian green cos, and the red cos, have been found to be by far the ſweeteſt and tendereſt. Theſe will endure the common cold of our winters full as well as the white cos: but they are more apt to rot, if the ſeaſon of their cabbaging be very rainy.

The green capuchin and the brown Dutch lettuces are very hardy ſorts, and may be ſown at the ſame ſeaſons as the common cabbage lettuce. They are very proper to plant under a hedge, or other fence, to ſtand the winter; becauſe they will often live there, when moſt of the other ſorts are deſtroyed. They will alſo bear more heat and drought, and therefore are very fit for late ſowings: nor do they run up to ſeed ſo ſoon as the other ſorts, after they are cabbaged. If ſome of them are planted upon a gentle hot-bed in autumn, and well covered with a frame, they will cabbage ſo as to be fit for uſe in February and March, and may be continued till thoſe in the open air are ready for the table. All theſe qualities render them valuable: eſpecially as, in conſequence thereof, they may be had at a time when there are but few others. To prevent their degenerating, none but the largeſt and beſt cabbaged of theſe plants ſhould be ſet apart for ſeed; and all the cautions before given, in this reſpect, ſhould be carefully obſerved here.

Beſides the general rule before-mentioned, of not ſuffering two different ſorts of lettuces ever to ſtand near each other when they bloſſom, leſt the mixing of their farina ſhould make both of them vary from their original, and partake of each other; it is neceſſary, eſpecially for thoſe which run up high, ſuch in particular as the Cilicia, the cos, and the other large growing ſorts, to thruſt down by the ſide of each, a ſtake to which its ſtem ſhould be tied, to prevent its being broken, or blown out of the ground by the wind. The ſeed-branches ſhould be cut as faſt as the ſeeds ripen, without waiting to have the ſeed of the whole plant together; for there will be frequently a fortnight or three weeks difference between the ripening of one part and that of another: and when they are cut, they muſt be ſpread upon a coarſe cloth, in a ſunny place to dry the ſeeds yet more. The ſeeds ſhould then be beaten or rubbed out, dried again in the ſun, and afterwards laid up in a dry place, where neither mice nor other vermin can get at them; for if they do, they will ſoon eat them up.

LIFT, a ſtile that may be opened like a gate.

LILAC, the name of a flowering ſhrub, cultivated in the Engliſh gardens, and ſuppoſed to grow naturally in ſome parts of Perſia, but is ſo hardy as to reſiſt the greateſt cold of this country.

There are three varieties of this ſhrub commonly cultivated here, which differ in the colour of their flowers, and alſo in that of their ſhoots and leaves; one of theſe has white flowers, one blue, and the third has purple flowers; the latter is commonly known by the title of Scotch lilac, to diſtinguiſh it from the other. This is the moſt beautiful of the three, and is probably called the Scotch lilac, becauſe it was firſt mentioned in the catalogue of the Edinburgh garden.

Theſe ſhrubs grow to the height of eighteen or twenty feet in good ground, and are divided into many branches; thoſe of the white ſort grow more erect than the other, and the purple or Scotch lilac has its branches more diffuſed than either. The branches of the white are covered with a ſmooth bark, of a grey colour; thoſe of the other two are darker. The leaves of the white are of a very bright green, but thoſe of the other are of a dark green; their ſhape and ſize are ſo near as not to be diſtinguiſhed thereby. They are heart-ſhaped, and are placed oppoſite. The buds of the future ſhoots, which are very turgid before the leaves fall, are of a very bright green in the white ſort, but thoſe of the other two are of a dark green. The flowers are always produced at the ends of the ſhoots of the former year, and below the flowers come out ſhoots to ſucceed them; for that part upon which the flowers ſtand, decays down to the ſhoots below every winter. There are generally two bunches or panicles of flowers joined at the end of each ſhoot; thoſe of the blue are the ſmalleſt, and are placed thinner than either of the other. The bunches on the white are larger; the flowers are cloſer placed, and larger than the blue; but thoſe of the Scotch are larger, and the flowers are fairer than thoſe of either of the other, ſo make a much finer appearance. The panicles of flowers grow erect, and being intermixed with the fine green leaves, have a fine effect; and if we add to this the fragrancy of their flowers, it may be ranged among the moſt beautiful ſhrubs which now decorate the Engliſh gardens. They flower in May, and when the ſeaſon is cool, theſe ſhrubs will continue three weeks in beauty, but in hot ſeaſons the flowers ſoon fade. Their ſeeds are ripe in September, which if ſown ſoon after, the plants will come up the following ſpring; but as their roots ſend out great plenty of ſuckers annually, ſo few perſons ever take the trouble to propagate theſe plants by ſeeds. I have raiſed ſeveral plants of the three ſorts from ſeeds, and conſtantly found them prove the ſame as the ſhrubs from which the ſeeds were taken. Theſe plants do generally flower the third year from ſeed; and I have always found them not ſo apt to ſend out ſuckers, as thoſe plants which were produced by ſuckers, ſo are much more valuable; for the others put out ſuch plenty of ſuckers, as that if they are not annually taken from the plants, they will ſtarve them.

Theſe plants thrive beſt upon a light, rich ſoil, ſuch as the gardens near London are for the moſt part compoſed of; and there they grow to a much larger ſize, where they are permitted to ſtand unremoved, than in any other part of England; for in ſtrong loam, or upon chalky land, they make little progreſs. If the ſuckers are ſmall, when they are taken from the old plants, they ſhould be planted in a nurſery, in rows three feet aſunder, and one foot diſtance in the rows, where they may ſtand a year or two to get ſtrength, and then they ſhould be removed to the places where they are to remain. The beſt time to tranſplant theſe ſhrubs is in autumn. *Miller's Gard. Dict.*

LILY, the name of a large genus of plants, with a kind of bell-faſhioned flower, and is compoſed of ſix leaves, which are more or leſs expanded and bent back. The piſtil ſtands in the center of the flower, and finally becomes an oblong and trigonal fruit, which is divided into three cells, and contains a number of marginated ſeeds, arranged in a double order one on another. To this muſt be added, that the root is of a bulbous form, and is compoſed of a number of fleſhy ſcales affixed to an axis.

All ſorts of lilies and martagons are propagated by ſowing their ſeeds; and if the ſeeds are carefully ſaved from good flowers, the martagons very frequently afford very beautiful varieties.

The manner of ſowing them is this: ſome ſquare boxes ſhould be provided of about ſix inches deep, with holes bored in the bottoms to let out the wet; theſe muſt be filled with freſh, light, ſandy earth, and the ſeeds muſt be ſown on them pretty thick in the beginning of Auguſt, ſoon after they are ripe, and covered over about half an inch deep with light ſifted earth of the ſame kind. They ſhould be then placed where they may have the morning ſun; and if the weather prove dry, they muſt be watered at times, and the weeds carefully picked out. In the month of October, the boxes are to be removed to a place where they may have as much ſun as poſſible, and be ſecured from the north and north-eaſt winds. In the ſpring the young plants will appear, and the boxes are then to be removed into their former ſituation: they ſhould be watered at times during the ſummer, and in Auguſt the ſmalleſt roots are to be emptied out of theſe boxes, and ſtrewed over a bed of light earth, and covered with about half an inch depth of light earth ſifted over them; they muſt here be watered and ſhaded at times, and defended from the ſeverity of the winter, by a light covering of ſtraw, or peaſe-haulm, in the hardeſt weather. In February, the ſurface of the bed ſhould be cleared, and a little light earth ſifted over it. When the leaves are decayed, the earth ſhould be a little ſtirred over the roots, and in the month of September following, a little light earth ſifted on. In the September of the following year, the roots muſt be tranſplanted to the places where they are to remain, and ſet at eight inches diſtance, the roots being placed four inches below the ſurface: this ſhould be done in moiſt weather. They will now require the ſame care as in the preceding winters; and the ſecond after they are tranſplanted, the ſtrongeſt roots will begin to flower. The fine ones ſhould then be removed at the proper ſeaſon into flower-beds, and planted at great diſtances from one another, that they may flower ſtrong. *Miller's Gard. Dict.*

LIME, a ſoft friable ſubſtance, obtained by calcining or burning ſtones, ſhells, and the like.

The moſt certain way to know whether any ſort of ſtone be fit for making lime, is to drop upon it a little aqua-fortis, ſpirit of ſea-ſalt, or oil of vitriol. All ſtones on which the above, or any other ſtrong acid effervesces or riſes in bubbles, are lime-ſtones, or will burn to lime; and the ſtronger the effervescence is, the fitter they are for that purpoſe. All country gentlemen ſhould keep ſome ſuch ſprit by them, to try the nature of the ſtones that may be found on their eſtates.

All lime is a very good manure, but that made of ſtone is much better than what is made of chalk. It makes the greateſt improvement upon light ſandy ſoils, or upon a dry gravel: wet and cold gravel is leſs benefited by it, and cold clay the leaſt of all. The common allowance is a buſhel to a pole ſquare, or a hundred and ſixty buſhels to an acre. Mr. Lummis laid after the rate of three hundred buſhels on an acre, and found it anſwer extremely well: but that was upon a ſtrong clay. His method of uſing it, as communicated to the Edinburgh Society, and the reſult, he ſays, of what he has experimented to be beſt, is as follows:

In the month of October, he lays together three or four of the largeſt ſtones (burnt into lime) on the ſward or turf of a ſtrong clay ground; or, as many of the ſmall ſtones as are equal to the large ones, ſo that ſeventy or eighty bolls (two hundred and eighty, or three hundred and twenty buſhels) may complete an acre. If rain falls, it melts immediately; if not, it will melt or flake in forty eight hours, or leſs, according to the moiſture of the air. He then ſpreads it directly, leaving no part of it upon the ſpot where the ſtones were laid. This done, he lets it lie twelve months, or till the month of November after the October twelve months, when he ploughs it in, and lets it remain in that ſtate all the winter, during which froſt and rains mellow and prepare the ground for the next ſpring ploughing, and render it fit for barley. He prefers this method to laying the lime on in powder, becauſe, in this laſt way, it is apt to be blown about with the wind, to the great detriment of both men and horſes, ſuch as ſpoiling the mens eyes, hair, and cloaths, and the eyes and hair of the horſes, making their coats look dry and ugly, beſides loſing much of the lime.

The lime laid in the month of October, as above directed, on a ſtrong arable land, which has been ſome years under graſs, and continuing ſpread for about twelve months before it be ploughed in, has been found ſo to alter the graſs to a fine natural clover, that, by feeding of ſheep or black cattle upon it, it has paid the whole charge the firſt year by the graſs; and cattle will chooſe rather to feed on this ground than any other, and grow fatter. If the ground be looſe and open, it may be ploughed in the enſuing March, if limed in October. In either way, it ſo far meliorates the ſward, and the ſoil, that the beſt of crops may be expected for three or four years; and by laying ſome dung upon it the 4th or 5th year, two or three crops more may be obtained; after which the ground will be in excellent order to lay down with graſs ſeeds.

Notwithſtanding that lime is ſo very good a manure, Mr. Lummis prefers marle, if it can be had within the ground, or near the place where it is to be uſed; for tho' it be more chargeable at firſt, yet, laſting five times as long, it is in the end much cheaper. He generally lays near two hundred loads of it upon an acre, at about ſeven or eight buſhels to the load.

Mr. Evelyn adviſes mixing the lime with the turf or ſward, laying them alternately, turf on lime, and lime on turf, in heaps for ſix months; by which means it will become ſo rich and mellow, as to diſſolve and run like aſhes, and carry a much more cheriſhing vigour, than if uſed alone in a greater quantity, and without danger of burning out and exhauſting the vegetative virtue which it ſhould preſerve. It is likewiſe greatly bettered by being mixed with dung, or with mud drawn from the bottom of ponds or rivers. In Weſtmorland, they reap fine crops of barley from their ſandy lands, by manuring them with lime and cow-dung mixed together.

The nature of lime on land is like that of chalk: it works downwards, as the farmers expreſs it, and is therefore beſt treated in the ſame manner, laying it upon a lay the year before it is to be ploughed up. When uſed on land which lies upon a deſcent, it ſhould by all means be mixed with dung, and laid principally on the higher part of the land; the conſequence of which will be, that the rain will waſh out the virtues of the lime and dung together, and carry them to the lower parts as it runs down. In fact, it does better on any land, when mixed with dung, than either of them alone. This is particularly obſerved in Shropſhire, where they lay dung and lime together, about twenty load of the former, and only twenty buſhels of the latter, on an acre of ground. In Leiceſterſhire, they ſow or ſcatter the lime on wheat land when they ſow the wheat; but on barley-land, the laſt

last earth but one, left it should burn the barley if sowed with it in the spring. They allow five quarters to an acre of each, reckoning by the measure in which it comes from the kiln; for after it is slaked, those five quarters will make near ten.

Lime is thought to make corn grow with a thin husk. It is a great destroyer of moss and rushes, even after it has been slaked; as quick lime is of the remnants of furzes, after the old bushes have been grubbed up. Its hot quality renders it apt to over-burn dry soils. It certainly is most efficacious when spread directly from the kiln.

Mr. Lisle, whose account of lime is almost unintelligibly perplexed and confused, thinks it is best, especially on lands that work mellow, to spread and plough it in this manure as soon as it is slacked, rather than to let it lie long in heaps covered with earth. He very properly gives it as a rule to all husbandmen, to be cautious of liming ground, and then ploughing out the heart of it; the bad consequences of which he himself experienced. "I limed, says he, some years ago, in Wiltshire, seven acres for an experiment, and laid down one acre to its own natural grass. In two years time this grass was, and still is, worth forty shillings an acre. The third year, I laid down another acre, which is still worth thirty shillings a year. The rest, which I ploughed five or six years longer, is not worth fifteen groats an acre. I have experienced the like in burn-baking ground."

The practice of Lower Normandy, where lime is chiefly used on lands newly broken up, is thus related by M. Du Hamel.

After giving these lands a shallow ploughing, they carry on the lime as it comes from the kiln, and lay about an hundred weight of it in a heap on every square perch; so that the heaps lie at a perch distance from one another; they then raise the earth all round the heaps, like so many basons: the earth which forms the sides of these basons should be a foot thick: and, lastly, they arch the heaps over with earth, six inches thick. The lime flakes under this covering, and is reduced to powder; but at the same time it increases in bulk, and thereby cracks the earth. If these cracks be not carefully stopped, rain will get through them, and reduce the lime into a paste, or kind of mortar, which will not mix with the earth, or answer the end proposed. Farmers are therefore very careful to examine the heaps from time to time, and stop the cracks. Some only press down the top of the heap with the back of a shovel: but this method is liable to a considerable inconvenience; for if the lime be in a paste within the heap, it is by this means beat together in such manner, that it becomes still more difficult to mix it with the earth: for which reason it is better to stop the crevices, by throughing a little fresh earth over the heap.

When the lime is thoroughly slacked, and reduced to powder, the heaps are cut with a shovel, and the lime is mixed as well as possible with the earth that covered it. This mixture is then thrown up in heaps again, and left exposed to the air for six weeks or two months; for then the rain will not hurt it.

About the beginning of June, this compost of lime and earth is spread upon land; but not by throwing it about unequally, or at random: on the contrary, it is taken up by shovelfuls, and distributed in little heaps, at equal distances, on each perch of ground, it having been observed, that these little heaps promote vegetation, more than if the manure was spread uniformly all over the field; nor is it at all heeded, if small intervals remain unlimed between each shovelful. The field is afterwards ploughed, for the last time, very deep: then, towards the end of June, it is sowed with buck-wheat, which is covered with a harrow; and if any clods remain, they are broken with a hoe.

Buck-wheat occupies the land about a hundred days; so that this grain, sown about the end of June, is gathered about the end of September. When the stalks and roots of this plant are dead and dried, the ground is ploughed up, and immediately sowed with wheat, which is harrowed in. After the wheat has been reaped, the land is ploughed as soon as possible. It is ploughed for the last time, in February or March, in order to sow oats; or in April for barley: but in this case it is turned up two or three times, to make it fine. All these different grains are harrowed in. A roller is passed over the oats when they are come up; and if any clods remain in the barley, they are broken with a hoe.

In the next February or March, the land is ploughed again, in order to sow it with grey pease or vetches: and after these pulse have been reaped, one or two ploughings are given, to prepare it for wheat in the ensuing autumn.

The next year, oats are sowed, sometimes mixed with a little clover; and then the ground is laid down to pasture for three or four years.

Sometimes no buck-wheat is sowed on land newly broken up; but it lies fallow, from the month of March, when it was first ploughed, till October, when it is sowed with wheat, after receiving several ploughings during the intermediate time. These lands being, by this means, brought to a tolerable tilth, not above three quarters of the quantity of lime above-mentioned is used on them, and they generally bear a better crop than those which are first sowed with buck-wheat.

Some farmers think a perch too great a distance for conveniently spreading the lime. They therefore make the heaps less, and increase their number in proportion. Others lay the lime in ridges, from one end of the field to the other; which facilitates the spreading of it. Being persuaded that lime is most efficacious when it lies shallow in the ground, they first plough it in, and then give a second ploughing before they sow, which brings it again near the surface.

Lime is commonly said to enrich land greatly at first, but afterwards, when its efficacy is exhausted, to leave the ground more barren than it was before. Lime readily unites with every unctuous substance, and renders it more soluble in water. By this means, all such particles mixed with the soil may be more speedily converted to the nourishment of vegetables, than they might otherwise be. Indeed, if the farmer's avarice, or want of judgment, tempt him to over-crop the ground, it may be left without matter fit to nourish plants, till a fresh supply is brought: but if it be judiciously cropped, and left in good heart under grass, or any other produce which does not impoverish the soil, the effect of the lime will be more durable, and more advantageous than is generally imagined.

LIME-KILN. *See the article* Kiln.

LIME-STONE, a species of stone which will burn into lime. *See the article* Lime.

LIME-TREE, or *Linden-Tree*, a beautiful tree for walks, and other decorations, in parks, &c. and of which Mr. Miller has enumerated four species.

All the species of the lime-tree are easily propagated by layers, which will, in one year, take good root, and may then be taken off, and planted in a nursery, at four feet distant row from row, and two feet asunder in the rows. The best time to lay them down and to remove them, is, when their leaves begin to fall, that they may take root before the frost comes on, though they may be transplanted any time from September to March, in open weather; but if the soil be dry, it is much the better way to remove them in autumn, because it will save a great expence in watering, especially if the spring should prove dry. In this nursery they may remain four or five years, during which time the ground should be dug every spring, and constantly kept clear from weeds, and the large side shoots pruned off, to cause them to advance in height; but the small twigs must not be pruned off from the stems, because these are absolutely necessary to detain the sap, for the augmentation of their trunks, which are apt to shoot up too slender, when they are entirely divested of all their lateral twigs. If the soil in which they are planted, be a fat loam, they will make a prodigious progress in their growth, so that in three years time they will be fit to transplant out where they are to remain.

They may also be propagated by cuttings; but as this method is not so certain as by layers, the other is generally practised. In order to obtain proper shoots for laying down, a lime-tree is cut down close to the ground, from the roots of which a great number of strong shoots are produced the following year; these will be large enough to lay down the succeeding autumn, especially if the ſmalleſt of them are cut off cloſe early in the ſpring; for when too many ſhoots are ſuffered to grow during the ſummer, they will be much weaker, than if only a ſufficient quantity be left. For the manner of laying down theſe ſhoots, *ſee the article* LAYER.

The timber of the lime-tree is uſed by carvers, it being a ſoft, light wood, as alſo by architects for framing the models of their buildings; the turners likewiſe uſe it for making light bowls, diſhes, &c. but it is too ſoft for any ſtrong purpoſes. *Miller's Gard. Dict.*

LINDEN-TREE. *See the preceding article.*

LING, heath.

LINSEED, the ſeed of the flax. *See the article* FLAX.

LIQUORICE, a plant propagated for medicinal uſes. It grows to about four or five feet high; its ſtalks are hard and woody; its leaves ſmall and roundiſh, ſtanding together on the two ſides of a rib, and making what botaniſts call a winged leaf.

A correſpondent of the editors of the Muſeum Ruſticum has given the following directions for cultivating this plant, founded on a long ſeries of experience.

" The common culture of liquorice is not difficult to be learned; and this, with proper attention, will enable any thinking farmer, that knows his buſineſs, to cultivate it to advantage.

" This plant thrives beſt on a deep, looſe, rich mould; and if it is freſh land, that has not for many years borne corn, the profit will be the greater, as the crop will be larger, and the roots of a finer quality.

" A rich ſandy ſoil, provided it is deep, will do well for this plant; and it muſt always be remembered, that too much moiſture is its greateſt enemy: let no one therefore attempt to plant it on a damp clay, leſt the whole crop be cankered.

" Land cannot be made too fine, nor dug too deep, for liquorice: it ſhould be, at leaſt, moved with the ſpade to the depth of two feet and a half, and if a little deeper, ſo much the better.

" If the land, on which the liquorice-ſets are to be planted, is freſh, rich, and in good heart, it needs no manure for the firſt crop; but if it has been for ſome years in tillage, the planter will do well to give it, in the ſummer time, a good dreſſing of very rotten dung, lime, and coal-aſhes or ſoot, mixed together, ſome months before, in a compoſt: the quantity muſt be regulated by the ſtate of the land, always remembering that this plant requires a great deal of nouriſhment, and is a great impoveriſher of land, though it extracts much of its nouriſhment, or food, from a conſiderable depth, at a diſtance from the ſurface; ſome of the roots running five or ſix feet, at leaſt, into the ground.

" When the ground is properly prepared, reduced to a very fine tilth, and laid level, ſome liquorice runners, or ſets, are to be procured. Theſe muſt be cut into pieces, about eight or nine inches long each, and planted in rows, with dibbers armed with iron points. I make my rows two feet aſunder, put my ſets fifteen inches from each other, and when three rows are planted on a ſix-feet bed, I allow two feet more of interval betwixt bed and bed.

" When I put in my ſets with the dibber, I leave the upper end of each ſet juſt level with the ſurface of the ground: I ſhould have obſerved, that I have all my ſets carefully inſpected before they are carried into the field, to ſee that each of them has one, if not two eyes, or buds, without which they would make no ſhoots.

" When the whole ſpot of ground is planted, I make my labourers dig up the intervals one ſpit deep, and ſpread the earth on the beds: this raiſes them about two inches above the head of the ſets, and by lowering the intervals, ſerves in wet ſeaſons to drain the beds. I generally contrive to get this work done by the laſt week in September; but in favourable years, the middle of October is not too late.

" If the weather proves mild, I have no farther trouble with them during the winter; but if it is likely to freeze hard, I cover the beds with peaſe-haulm, or long dung, or ſome ſuch matter, to forward the growth of the roots in the ſpring, and protect them, during the winter, from the froſts.

" Early in the ſpring, on the firſt appearance of the weeds, I allow my liquorice a thorough hoeing; and this is ſeveral times repeated in the dry weather of the ſummer.

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" The winter following, I again cover them with long dung, and in the ſpring, before the roots begin to ſhoot, I have the ſpaces betwixt the rows on the beds looſened with a ſpade, and the intervals are well dug: immediately after which, I give the land a ſlight dreſſing of coal-ſoot, ſown by hand: it ſhould be thick enough to make the land look black: this the firſt rains waſh in, and it greatly warms and invigorates the plants.

" The ſecond and third ſummers, all I have to do, is to keep my crop clear of weeds: this, indeed, is very neceſſary, and the hoeings for this purpoſe muſt be more or leſs frequent, according to the ſeaſon; generally, three times in the ſummer are quite ſufficient, eſpecially if the land was well prepared before the ſets were planted.

" Many good ſenſible farmers, whom I have known to cultivate this plant, in autumn have a practice of cutting down the ſtalks, whilſt they are in full ſap, thinking thereby to ſtrengthen the roots. I differ from them, however, in opinion, and am rather apt to imagine, that this cutting of the ſtalks, whilſt the ſap is in motion, muſt be prejudicial to the roots. It is, therefore, my cuſtom, always to defer cutting off the ſtalks, till they are withered, and begin to decay; nature then indicating, that an abſtraction will be of ſervice.

" Theſe roots ſhould have three ſummers growth before they are fit to take up: it is very ſeldom that they have attained a proper ſize at two years end; and if you leave them longer than three years in the ground, the roots are apt to grow ſticky, and loſe a part of their ſaccharine quality.

" I never take them up till the ſap is entirely at reſt, and the leaves and ſtalks are withered: they are then in prime order, and fitteſt for ſale.

" If theſe roots are taken up while the ſap is in motion, either early in the autumn, or late in the ſpring, they are apt to ſhrivel, and loſe much of their weight, and are, beſides, more diſpoſed to ferment and periſh.

" The beſt way of taking them up is, to dig the ground over as deep as the principal roots run, having pickers ready to gather up the roots as faſt as they are thrown up by the ſpade.

" My general practice is to get rid of my roots as ſoon as I conveniently can: and I find it better ſo to do, than to wait for the riſing of the markets. I have had, from one acre of fine, freſh, rich land, above 3000 pounds of ſaleable root, which has produced me above ſixty pounds; but this many years ago, my crops not being general now ſo large.

" When I have taken up a crop of this root, if it was planted on freſh land, I generally prepare the ſame ground to yield me another crop; and this takes me near a year.

" I, in the firſt place, give it, during the winter froſts, a thorough good dreſſing of well-rotted dung, mixed with lime: of this I lay on large quantities, ſtill having regard to the condition of the ſoil, and ploughing it well in the enſuing ſummer.

" In ſuch looſe ſoils, as are proper for this plant, there is no occaſion to dig the land for this crop, the taking up the roots having ſtirred it to a great depth: this, with three or four ſummers ploughings, is ſufficient.

" As to the reſt, I manage the ſame as I did for the preceding crop.

" If the land, which has borne me a crop of liquorice-root, was not freſh land when it was planted, but had been any time in tillage, I ſcarcely ever chuſe to plant it again with the ſame crop, without allowing ſeveral years of interval, at leaſt ſeven; but in this caſe, I frequently ſow oats in the ſpring, to abate the rankneſs of the ſoil; and it will then, with a very ſlight dreſſing, give me a good crop of wheat.

" In my method of cultivating this plant, I always allow ſpace enough for the roots to extend in ſearch of food; and this is my reaſon for planting my rows at two feet diſtance: I am, beſides, very careful of keeping them clear of weeds, and that, particularly, during the firſt ſummer; being very ſenſible that, without this precaution, they would be in great danger of being choaked up, and robbed of their proper ſhare of nouriſhment; particularly, they would receive no benefit from the dews, which are ſo friendly to vegetation; and even the ſun's warmth would be, in a great meaſure, kept from the roots by the ſhade of the weeds.

" Many

"Many, who plant liquorice, allow much leſs ſpace than I do betwixt the rows, and will yet, the firſt ſummer, take off a crop of onions, or ſpinage, or young carrots, and think it ſo much clear profit; but the queſtion is, whether theſe crops may not, during the time they are on the ground, be, to all intents and purpoſes, deemed weeds, having nearly, if not altogether, as bad effects, as weeds would if have permitted to grow with the crop.

"Some, worſe farmers, continue this practice two years of its growth; but it is quite needleſs to condemn this method of culture, as it cannot but ſtand ſelf-condemned.

"In the dreſſings I give my land, for preparing it to receive this plant, experience has convinced me that lime is a much ſweeter manure than ſtable-dung: in fact, this laſt is not, on any account, to be uſed till it is quite rotten, and then lime is very properly added to it as a corrector.

"Some friends of mine, who live very near London, have attempted to cultivate this plant on their lands; but they find it does not anſwer; and this, on account of the great richneſs of the ſoil, owing to the great quantity of London dung laid on it. It is true, the roots were at three years end larger than mine; but they were not ſo bright, but had a blacker coat, and were deemed greatly inferior in quality.

"Should any of your readers be inclined to cultivate this plant, by following theſe directions, not implicitly, but according to their diſcretion, the circumſtances of their ſoil, &c. conſidered, they cannot well fail ſucceeding." *Muſeum Ruſticum, vol.* I. *pag.* 252.

LITTER, the ſtraw laid under horſes, &c.

LIZENED *Corn*, leſſened, ſhrunk, or lank corn.

LOAM, an earth compoſed of diſſimilar particles, hard, ſtiff, denſe, and rough to the touch, and compoſed of ſand and a tough viſcid clay.

LOE, a little round hill, or heap of ſtones.

LOG, a large, ſhapeleſs piece of wood.

LOOP, a hinge of a door.

LOP, a flea.

LOPPED *Milk*, ſuch as ſtands till it ſours and curdles of itſelf.

LOPPING, the cutting off the ſide branches of trees.

It is very obſervable that moſt old trees are hollow within; which does not proceed from the nature of the trees, but is the fault of thoſe who have the management of them, who ſuffer the tops to grow large before they lop them; as the aſh, elm, hornbeam, &c. and perſuade themſelves, that they may have the more great wood; but in the mean time, do not conſider that the cutting off great tops endangers the life of a tree; or, at beſt wounds it ſo, that many trees yearly decay more in their bodies than the yearly tops come to; and at the ſame time that they furniſh themſelves with more great wood, they do it at the loſs of the owner. And, indeed, though the hornbeam and elm will bear great tops, when the body is little more than a ſhell; yet the aſh, if it comes to take wet at the head, very rearely bears more top after the body of the tree decays. Therefore, if once theſe trees decay much in the middle, they will be worth little but for the fire; ſo that if you find a timber-tree decay, it ſhould be cut down in time that the timber be not loſt.

The lopping of young trees, that is, at ten or twelve years old at moſt, will preſerve them much longer, and will occaſion the ſhoots to grow more into wood in one year, than they do in old tops at two or three. Great boughs, ill taken off, ſpoil many a tree; for which reaſon they ſhould always be taken off cloſe and ſmooth, and not parallel to the horizon; and cover the wound with loam and horſe-dung mixed, to prevent the wet from entering into the body of the tree.

When trees are at their full growth, there are ſeveral ſigns of their decay; as the withering or dying of many of their top branches; or if the wet enters at any knot; or they are any wiſe hollow or diſcoloured; if they make but poor ſhoots; or if woodpeckers make any hole in them.

This lopping of trees is only to be underſtood for pollard-trees; becauſe nothing is more injurious to the growth of timber-trees, than that of lopping or cutting off great branches from them. Whoever will be at the trouble of trying the experiment upon two trees of equal age and ſize, growing near each other, to lop or cut off the ſide branches from one of them, and ſuffer all the branches to grow upon the other, will in a few years, find the latter to exceed the other in growth every way; and this will not decay near ſo ſoon.

All ſorts of reſinous trees, or ſuch as abound with a milky juice, ſhould be lopped very ſparingly; for they are ſubject to decay when often cut. The beſt ſeaſon for lopping theſe trees is ſoon after Bartholomew-tide; at which time they ſeldom bleed much, and the wound is commonly healed over before the cold weather comes on. *Miller's Gard. Dict.*

The generality of the world are againſt pruning timber trees at all, and where they naturally grow ſtraight and regular, it is much better let alone. But all common faults in ſhape may be regulated by this lopping them while young, and it can be attended with no ill conſequence to the timber; for the cut not lying near the timber pith cannot affect it, when grown up, and ſquared in the working for beams and other uſes, or to be quartered; for all the defects occaſioned by ſuch wounds, are in the ſuperficial parts, and all the four quarters are perfectly ſound within.

As to the large foreſt trees, they ſhould not be lopped at all, except in caſes of great neceſſity, and then the large boughs muſt not be cut, but only the ſide branches; and even theſe muſt be cut off cloſe, that the bark may ſoon cover the wound, and yet a little ſlanting, that the water may run off, not lodge upon the cut part.

If there is a neceſſity of cutting off a large bough, as by its being broken or cankered, let it be cut off ſlanting at about four feet diſtance from the body of the tree, and that if poſſible near ſome place where there is a young ſhoot from it, which may receive the ſap, and grow up in its place. No ſtump muſt be left ſtanding out farther than this, becauſe they are wounded parts which never can heel, and which will always be letting in the water, and will ſerve as pipes to convey that water into the heart of the body of the tree, and by degrees will utterly ſpoil it. All that grow upright, whether they be large or ſmall branches, muſt in cutting be taken off ſlanting, never evenly, for the ſame reaſon; thoſe boughs that bear from the head are to be cut with the ſlope on the lower ſide, and on any occaſion that great wounds are given to a tree, they ſhould be covered with a mixture of clay and horſe-dung, which will make them heal much ſooner than they otherwiſe would do. *Mortimer's Huſbandry, vol.* II. *page* 91.

To LOWK, to weed corn.

LUCERN, a plant frequently cultivated in the manner of clover, and known among botaniſts by the names of medica and medicago.

It is the alfaſa of the Spaniards, and the lucern grand treffle, or fænum Burgundiacum, as ſome botaniſts call it, of the French. It has a perennial root, and an annual ſtalk, which riſes full three feet high in good land, and is garniſhed at each point with trifoliate leaves, whoſe lobes are ſpear-ſhaped, about an inch and a half long, and half an inch broad, ſawed towards the ſtalks. The flowers grow in ſpikes, which are from two to near three inches in length, ſtanding upon naked footſtalks two inches long, riſing from the wings of the ſtalks: they are of the pea-bloom, or butterfly, kind; of a fine purple colour, and are ſucceeded by compreſſed moon-ſhaped pods, which contain ſeveral kidney-ſhaped ſeeds. It flowers in June, and its ſeed ripens in September.

There are the following varieties of this ſpecies of lucern, viz. one with violet-coloured flowers; another with yellow flowers; a third with yellow and violet flowers mixed; and a fourth with variegated flowers: but, as Mr. Miller obſerves, theſe are only variations of the ſame plant, ariſing accidentally from the ſeed. However, neither the yellow nor the variegated flowered lucern, is ever ſo ſtrong as that with purple flowers; nor is it, conſequently, ſo profitable to the huſbandman.

Columella calls this the choiceſt of all fodder, becauſe it will laſt ten years, and will bear being cut down four, and ſometimes ſix times in a year; it enriches the land on which it grows, fattens the cattle fed with it, it, and is a remedy for fick cattle. About three quarters of an acre of it is abundantly fufficient to feed three horfes during the whole year. Yet, notwithftanding it was fo much efteemed by the ancients, and hath been cultivated to great advantage in France and Switzerland for many years, it has not yet found fo good a reception in England as it juftly deferves; nor is it cultivated here in any confiderable quantity, though it will fucceed as well in this country as in either of the laft mentioned; being extremely hardy, and refifting the fevereft cold of our climate.

Mr. Rocque lays it down as a maxim in his practice, that lucern will grow on any foil, provided it be not fo wet as to rot the roots.

The ftrongeft land is however to be preferred, and the deeper the foil, the better will be the crop, as the roots will have room to extend themfelves.

The land fhould be prepared in the fame manner as for barley, being ploughed, harrowed, and cleaned from all forts of weeds; and the ftronger the land is, of courfe the more ploughing and harrowing it will take to mellow it, fweeten it, and bring it to a fine tilth.

When this work is done, the lucern feed muft be fown broad-caft, (not in drills) in fine weather, after the rate of about fourteen pounds to an acre.

This allowance of feed will be fufficient to fupply the number of plants that will be wanted to yield a full crop; but they will not ftand fo thick as to ftarve one another, though there is fome allowance for part of the feed failing.

But fhould every feed take, the method of culture hereafter recommended will fufficiently reduce the number of the plants, and, without the trouble and expence of the New Hufbandry, give each plant fpace enough to extend its roots, and collect the neceffary quantity of nourifhment.

To return to the culture, before the laft ploughing, the land fhould be manured, not with old rotten ftuff, as is ufual; but with frefh ftable-dung, that has been thrown up in a heap three or four weeks to heat and ferment. This will enable the young plant to pufh forth its leaves and ftalks with luxuriance, and get forward in its growth the firft fummer.

When the dung is in full fermentation, it is to be laid on the land, and ploughed in as foon as poffible, that the falts of the dung may not have time to evaporate: the land muft then be harrowed and fown, and afterwards again harrowed with a light or bufh-harrow; and, laftly, rolled to fettle the ground and break the clods.

If corn is to be fown amongft it, it fhould be only half a crop; otherwife it will be apt to deftroy the lucern, efpecially if it proves a wet feafon, and the corn is rank: but if no corn is fown amongft it, the lucern will thrive much better.

Lucern may be fown from the beginning of March to the end of May; but April, in dry weather, is the beft time.

If much rain falls on the new-fown lucern, it will be apt to fwell too faft, and burft; but if it holds fine three or four days, it will be in no danger.

Mr. Rocque does not approve of drilling the lucern, becaufe the roots are too much confined in the drills: they fay it is to clean the lucern between the rows that they drill it; but it is for want of knowing the nature of lucern, and it difcourages people from fowing it, drilling and hoeing being very expenfive ways; the quickeft and cheapeft, and by much the beft way, being to fow it broad-caft, like clover, as the roots will ftand nearly at equal diftances one from another every way.

Lucern requires, it is true, a great deal of nourifhment from the earth; but there is no occafion this nourifhment fhould be fupplied by the furface. It is well known that the roots of lucern will run to a great depth in the ground, from whence they muft of courfe extract a large quantity of food: this fpares the furface; and in fact the land where lucern grows requires only that the natural grafs fhould be prevented from getting to a head, which it is in our climate very apt to do, and if let alone would foon choke up the lucern.

It is mentioned above, that if corn is fown with lucern, it fhould be only half a crop: fome of your readers may not, perhaps, readily comprehend the meaning of this expreffion; therefore, to render it more clear, I fhall here obferve, that when barley or oats are to grow with lucern, a bufhel only of either, according to Mr. Rocque's method, is to be fown firft on an acre, then fourteen pounds of the lucern.

One thing is to be obferved; that if the corn, notwithftanding its being fown fo thin, fhould grow fo rank as to endanger the lucern, it will be much beft to mow it before the harveft, as it is better to lofe the crop of corn than to kill the lucern.

The barley, or oats, however, need not be entirely loft, as they may, when mown, be given green to cattle; or, if the weather is fine, will make excellent hay, provided they are properly dried; and it is beft to do it in the fwarth, as the rich juices are in that manner lefs exhaufted. To fow it later than May is dangerous, for fear of a dry feafon, or its being eat up by the fly.

Lucern will not grow on frefh-broke up land; it muft be tilled a year or two: peafe and beans, for one year, will prepare the ground; but above all, potatoes excel for fweetening and mellowing of land: the next feafon a fallow for turnips; and when the turnips are fed off with fheep, it will greatly enrich the land, which fhould then be prepared for lucern.

In regard to the tillage, and time of fowing the lucernfeed, the nature of the foil muft be confidered. Heavy ftrong land will require more ploughings and harrowings, and to be later fown; light land will need fewer harrowings and ploughings, and to be fown earlier, that the young plants may have ftrength to fend their roots deep into the ground, before the hot dry weather comes on to hurt them; and if, for the firft time, the land had a trench-ploughing, it would be of great advantage.

In Languedoc they fow no corn with the lucern; and when it is fix or feven inches high, they mow it; by which all the feeds of annual weeds are cut off and killed.

In Normandy, the climate being much the fame as in England, they fow corn with it.

In Picardy, and about Paris, they fow it, fome with, others without corn.

At Avignon, when their lucern begins to decline, they manure their ground and plough afrefh, and fow it with corn and lucern; and the old roots, growing again with the feed, make another fine crop: the ploughing will not hurt the old roots.

If a full crop of barley is fown with lucern, and the barley grows very ftrong, the beft way is to mow the barley when it is in the ear.

If forward peafe are fown on new-broke-up land to prepare it for lucern, it may be done in one year, and turnips fown on it as foon as the peafe are off: the turnips may be fit to feed off by Chriftmas; and as foon as the turnips are off, the land fhould be ploughed, and lie fallow till a proper time to ftir it again; or it may have a trench-ploughing, as before directed.

This method of giving land a trench-ploughing, to prepare it for lucern, is much to be recommended, as it ftirs the earth almoft as deep as if it was dug with a garden fpade: of what advantage this muft be to a plant that fends its roots deep for nourifhment, need not be mentioned, as it cannot but be obvious to every reader.

Was labour cheaper than it is in England, it would doubtlefs be much the beft way to dig by hand all the land that was deftined to lucern: many advantages would refult from this method of tillage, and particularly the weeds and grafs would not be fo apt to grow as in ploughed land.

I would heartily recommend it to fome of the gentlemen in Ireland, to fow with lucern fome of their land that has borne a crop of potatoes; it could not fail fucceeding, and they would have a fair opportunity of trying what crops this plant will, when beft cultivated, yield.

I cannot but think, that on good land that had borne potatoes, there might be five good mowings in a year, particularly in Ireland, where the climate is rather milder than in England; and this without injuring the roots. An eafy experiment would, however, foon make this matter known: I therefore heartily recommend it to the attention of your Irifh readers; they are every day improving their lands,

lands, and will, doubtleſs, not ſuffer this hint to paſs unnoticed.

When we conſider the many advantages reſulting from the culture of this plant, it is aſtoniſhing that it ſhould ſo long eſcape our regard: the hint was given us by the Roman writers on the ſubject of agriculture, but we were too much attached to old cuſtoms to improve it.

In hot ſummers the ſeed may be ſaved in England, but not from the firſt growth; that being generally too rank, and ſubject to rot at bottom.

In Languedoc they ſave it from the third growth; but as this climate is colder, it will not have time to ripen, unleſs ſaved from the ſecond growth.

A dry ſoil is beſt to ſave the ſeed upon, as it is not ſo apt to grow rank; and then it may poſſibly do from the firſt growth.

As lucern, if the land is good, will bear ſeveral crops in one year, like clover; what Mr. Rocque means by the firſt, ſecond, and third growths, are, he ſays, the different crops it produces in one ſummer, which are three, four, and ſometimes five mowings, in caſe no ſeed is ſaved from it; if ſeed is ſaved, it muſt be from the ſecond growth: the ſeed will be ripe in September, and muſt be gathered by hand.

When the plants are one year old, it will be proper with a large harrow, to go over your land as often as is ſufficient to root up annual weeds and graſs.

The harrow will not hurt the lucern, the roots of it being very tough: this muſt be done in dry weather, before it begins to ſprout, which is very early in the ſpring, that the weeds and graſs may die; and if there are any patches of ground where the ſeed miſcarried, a little ſeed muſt be ſown, and the ſpot harrowed: a dreſſing with rotten-dung, at the ſame time, will repay the expences of it by a larger crop: if the harrow ſhould cut or wound any of the roots, they will ſprout and grow notwithſtanding.

The ſecond ſpring, after ſowing, it will be proper to plough the ground, where the lucern grows, with a drill-plough, with a round ſhare, without a fin or feather, and without a coulter, to prevent the roots being too much hurt. It ſhould lie rough a few days to dry and mellow; then, in fine weather, be harrowed down, to mow it the cloſer.

One, not uſed to the culture of this plant, will be apt to think, that ploughing will deſtroy the lucern; but any gentleman, that will take the trouble to call at Mr. Rocque's, may be convinced that experience teaches the contrary.

To make hay of lucern, it ſhould be mowed as ſoon as the bloom appears, or rather ſooner: it muſt not be ſpread, like common graſs, but lie in the ſwarth, like clover, and turned in the ſame manner; or the leaves, which are moſt nutritive, will drop off.

If ſuffered to ſtand too long before it is mowed, the ſtalks will be too hard for the cattle to eat it, and it loſes much of its goodneſs.

The hay is good for all ſorts of cattle; and when horſes are fed with it, they ſhould not have their full allowance of corn; the lucern anſwering, in a great meaſure, the purpoſe of both corn and hay.

It is alſo the moſt profitable of any ſort of fodder to feed horſes with in the ſummer, by mowing and giving it to them green.

If the land is good, the produce is incredible; and according to the goodneſs and depth of the ſoil, ſo will the crops be.

Mr. Rocque ſays he has ſeen lucern mowed five times in a ſeaſon; yielding, at the five mowings, nearly eight loads of hay per acre.

The ſpring ploughing amongſt the lucern muſt be annually repeated: it kills the graſs and weeds, and makes the ground ferment, which promotes vegetation; and the oftener it is refreſhed with a little dung on the ſurface, the better it will pay for the trouble of cultivating it. If the dung is laid on before the winter, that the ſalts may be waſhed in by the rain and ſnow, and ploughed in, in the ſpring, it will greatly add to the profit.

This is the ſubſtance of Mr. Rocque's account of the culture of lucern; but as different ſorts of ſoil may require different methods of tillage, he has ſubjoined the idea of a harrow, with two handles like a plough, which may ſerve in light land inſtead of the plough, and will ſave ſome labour.

The teeth muſt be ſet at ſeven or eight inches apart in the firſt row, and about five inches long without the wood. The ſecond row muſt be placed nine or ten inches behind the firſt, and ſo that the teeth of the ſecond row may be againſt the ſpaces of the firſt row; and they muſt be an inch longer than thoſe in the firſt row, ſo that the ground, being looſened a little by the firſt row, the teeth of the ſecond row may go ſomething deeper; and the teeth of the third and laſt row muſt be an inch longer than thoſe of the ſecond, and placed ſo as that they may go in the ſame tract with the teeth of the firſt row.

The harrow muſt be made of one ſolid piece, four or five inches thick, and the lower ſide muſt be rounded off towards the hinder part where the teeth are longeſt; whereby the perſon that holds it by the handles, preſſing down a little, may force the ſecond and third rows of teeth deeper than the firſt; and, by bearing up a little, he may prevent any but the firſt row from working. A very little practice will be ſufficient to make any one uſe it as occaſion requires; and it will be ſo ſteady that no unevenneſs of the ground will be able to throw it out of its work, as a clod or ſtone will a common harrow.

. . . . .
. . . .   } The manner the teeth are to be placed in.
. . . . .

Let it be remarked, that the foremoſt row of teeth are placed in a line acroſs near the middle of the block or plank; the other two rows behind that; and the fore part of the harrow ſhould be heavier than the hind part when the weight of the harrow is ſuſpended on the firſt row of teeth. The teeth ſhould be pretty ſtrong, and round; their being ſquare, as uſual, may hurt the roots a little, which is to be avoided as much as poſſible, though the conſequence would not be very great.

Farmers are fond of ſowing broad-caſt, it being no eaſy matter to make them comprehend the utility of a drill-plough on any occaſion: the ſight of ſo complicated an inſtrument terrifies them; they think it moves by clock-work: and as to the labourers, it is a very difficult matter indeed to get them to hold it.

I am fully ſenſible, as I have already obſerved, of the good effects of ſowing corn and pulſe regularly with intervals, but cannot approve of this method when applied to artificial graſſes; and it would be well if we were to improve our old practices, before we ſhould even attempt to bring the new methods into general uſe. *Muſeum Ruſticum, vol. I. page* 78.

In the ſucceeding volume of the above work, another correſpondent has made the following remarks on the above method delivered by Mr. Rocque.

This gentleman, ſays our author, owns he is againſt innovations in huſbandry, becauſe it is difficult to bring the farmer from the old methods; and therefore ſeems to conclude, new ones are not to be attempted; at leaſt, that ſeems to be his reaſon for being againſt what he calls innovations.

Under "reſtrictions, &c." he approves of the new culture, but thinks it "prepoſterous to extend it to artificial graſſes;" adding, "the only benefit lucern can receive from the horſe-hoe, is, that it keeps down the natural graſs." This gentleman cannot be a practical cultivator of lucern; neither can he know the uſes of the hoe-plough; if he did, he could not aſſert a fact ſo contradictory in itſelf!

To inaccurate obſervers the ſeedling plant of lucern may appear to have no lateral roots; but a careful examiner will find a great number of ſmall ones, every one, or moſt, of which are furniſhed with freſh nutriment by the operation of the hoe-plough.

We ſhall not contend about Mr. Rocque's ſuperior profit: his ſituation gives him advantages ſuperior to a diſtant reſidence; and therefore that ſhould not be mentioned by a generous writer.

I am a favourer and practiſer of the New Huſbandry; and I do deny that it will be more expenſive than Mr. Rocque's method, but, on the contrary, it will eventually be cheaper.

By his method he may, for a few years, have pretty good crops; but at length his plants will be found to dwindle, and his crops will leſſen, unleſs he annually adds ſeed to the ground; whereas, in the new culture, the crop will be continually improving: as to the quality being inferior, that will be the fault of the owner, if he lets it grow too rank. This argument of your writer makes againſt himſelf, as thereby he admits the ſuperior luxuriance of the plants cultivated by the horſe-hoe.

I have ſown lucern in broad-caſt more than once, and have ſeen others do it; and it ever failed.

Mr. Rocque's rule, as this gentleman ſays, is, "that lucern will grow on any land, if not wet:" this is certainly premature: it ſurely muſt have the occupation of a dry, rich ſoil, or I am ſure, from practice, it will not ſucceed; and as to "the ſtrongeſt being preferred," I believe every one, who tries the cultivation of it on ſuch, and upon light ground, will find the latter beſt adapted to it.

But the notion of ſowing corn with lucern is quite as "prepoſterous," I think, as the new culture for it; and how a man of Mr. Rocque's famed abilities ſhould adopt ſuch a method, I am at a loſs to gueſs. Neither ſhould lucern be ſown in March, as in its infant ſtate it is very tender, and timid of froſt.

This gentleman ſays, "it is for want of knowing the "nature of lucern, that they drill it." I might retort upon him; but his miſtaken zeal, I fear, will more injure the cauſe he means to promote, than I hope it will diſcourage the practice of drilling this valuable plant, as, by all men who adhere to rational principles, that hath been found the moſt ſucceſsful method. See Tull, Duhamel, &c. I ſhould be glad to know what "the ſurface of the ground is to be ſpared for:" is it to give life to the natural graſs, that common and deſtructive enemy of this excellent plant?

Our author mentions the cultivation of it in France, &c. If he was ever at Paris, with his preſent attention, he muſt have ſeen, that after a few years they always plough up the promiſcuous ſown lucern, in order to prepare the ground again for that, or ſome other crop, when the lucern begins to dwindle by the weeds or natural graſs robbing it of its nutriment.

How much more muſt that be the fate of promiſcuous ſown lucern in theſe kingdoms, where he admits graſs is apt to get a-head? That is not the caſe in France, and yet even there promiſcuous ſown crops are ſhort lived.

I know not whether he be as converſant with potato-ground in Ireland as I am; but I cannot omit to inform you the tillage will not do for lucern: for this plant the ground ought to be well pulverized; whereas, in the general potato tillage of this kingdom, not more than about two feet in nine of the ground is cultivated.

The manner of harrowing the lucern, practiſed by Mr. Rocque, although the teeth be round, muſt wound many of the roots: that might be well, as it would thin them; but repeated harrowing will, in time, wound them all; and notwithſtandig they will afford graſs afterwards, yet, when the winter rain comes on, lodgments of water will be made in thoſe wounds, which will bring on putrefaction, to the deſtruction of the plants, unleſs Mr. Rocque has the art of conducting the harrow-pins always in the ſame direction: and, could that be the caſe, what would deſtroy the graſs where they did not paſs?

The manner of ploughing the lucern, practiſed by Mr. Rocque, is ſtill approaching the horſe-hoe, though by no means ſo effectual. I wonder to ſee our author even favour that, ſince it may be deemed an "innovation." This ploughing is to be repeated every year, and harrowing alſo: to this dung is to be added, "as often as may be." I am willing to believe this gentleman knows nothing of the expence which attends theſe operations, *i. e.* ploughing, harrowing, and, above all, dunging, beſides the value of the dung, which would always be acceptable for other grounds; whereas, in the drill way of ſowing lucern, when the land is once put in good order, it may ever be kept ſo by the hoe-plough.

Lucern is a graſs of ſuch ineſtimable value, that it will anſwer almoſt any expence; yet if the moſt certain method to obtain ſucceſs ſhall be found the cheapeſt, there can be no reaſon for purſuing one more precarious and more expenſive, which will be found when Mr. Rocque's method, or at leaſt that ſo warmly recommended by your correſpondent, who aſſerts it to be Mr. Rocque's, is compared in practice with the one I venture to recommend to the practice of my countrymen, which I take upon me to ſay will command ſucceſs, if purſued.

The land ſhould be a flexible loam, dry, deep, and rich, either by nature, or made ſo by art; not but it will ſucceed to admiration ſhould a quarry be under. It ſhould be well pulverized by plough and harrow, laid as flat as poſſible, and cleared of all weeds, particularly ſcutch-graſs: when the ground is in this form, let a ſmall plough, with two mould-boards, be run up and down the field, at every three foot upon the flat ſurface: this will compleatly form three foot ridges. If a pair of drill-harrows be not at hand, let the crown of every ridge be carefully raked clean and even with an iron rake, and one row of ſeed drilled very thin, about half an inch deep, along the middle of every ridge, the middle or latter end of April, (the beginning of May may do) and be carefully covered. This ſowing of the ſeed may be done by hand, if a drill-plough be not ready. By a maſter's attendance, a great deal may be done in a day.

Thus it may remain till weeds begin to appear, when the hoe-plough, or a ſmall common one, ſhould take away every alternate ſide of the ridges, as near the lucern as can be with ſafety. (I go within two or three inches of my drilled crops.) In three or four days, return the mould to the former places with the plough, and then proceed to take off the other ſides of the ridges in like manner, and return it as before.

If the ground be made in good condition before ſowing, a crop may be mowed in July, the produce of which will ſurpriſe any one who is not acquainted with the plant.

In September it will be fit to cut again; but if in the intermediate time weeds ſhould appear, let the hoeing be repeated: thus the weeds will be deſtroyed the firſt year.

After the ſecond cutting, ſend in the plough again, and take off the ſides of every ridge within about ſix inches of the plants, and ſo let them remain till February, when the plough ſhould return the mould to every ridge; and in May the graſs will be ready for cutting, and will continue to afford a crop every month during the ſummer.

The hoeing ſhould be repeated, as before directed, as often as weeds appear; but obſerve never to horſe-hoe it when the ground has any adheſion.

The hoeing before the winter is to keep the plants dry during that ſeaſon, and to meliorate the ſoil of the alleys by the influence and mechanical operation of the winter froſts.

To keep my letter within reaſonable compaſs, I have been ſhort in my directions, but to practical farmers, I hope, ſufficiently plain; if not, any neceſſary explanation I ſhall chearfully furniſh.

Your readers will pleaſe to obſerve, that after the firſt preparation of the ground, if they horſe-hoe the crop regularly every year, the dung which Mr. Rocques's friend recommends (as it may be got eaſily at in London) may be ſaved for other purpoſes, as by this method of managing lucern, the crop and ground will be improving every year.

I appeal then to every impartial judge, whether this method is not cheaper than the ploughing, harrowing, and dunging, ſo warmly recommended by your correſpondent. It is almoſt unneceſſary to urge, that a crop raiſed in this way will, ever after the firſt year, be equal, if not ſuperior, to Mr. Rocque's, as the gentleman admits as large crops may be raiſed in the drill way.

I am a ſtranger to Mr. Rocque and his fried. I have no other motives in troubling you on this ſubject, than a public benefit to mankind, and a gratitude to the memory of Mr. Tull, whoſe ſuperior ingenuity, I bluſh to own it, hath ſhone in France, to the reproach of Engliſhmen. And were we all to join in opinion with your correſpondent (who ſays, "It would be well were we to improve our old practices, before we even attempt to bring the new ones into general uſe") we ſhould indiſcriminately merit the pity of all nations for our perverſeneſs. Perhaps, had Tull been a foreigner, his ſyſtem would have been eſtabliſhed amongſt us long ago.

The

The author of the former account not being fatisfied with the reafons offered by his antagonift, made the following reply; which we thought neceffary to infert, that our readers may judge for themfelves, and follow the method that fhall appear to them the moft rational.

I troubled you the beginning of laft year with a letter on the fubject of lucern, which you were fo obliging as to infert in your firft volume, page 339.

I am ftill an advocate for Mr. Rocque's method of culture in preference to Mr. Miller's, as far as regards this plant; and that for this plain reafon, becaufe I imagine the farmer will be much more likely to adopt the firft than the laft; and the culture of lucern can produce very little advantage to the nation, unlefs it is generally adopted by the common farmers.

My reafon for troubling you, or your readers, at this time, is to remind you, that Mr. Rocque's fmall tract, lately publifhed, contains fome particulars refpecting lucern, which were not noticed in my former letter, and therefore may, with great propriety, be now laid before your readers.

The firft of thefe partitulars relates to the manner of fowing the lucern; and in this Mr. Rocque differs widely from Mr. Miller, as he thinks it fhould not be fown without corn; but I will give you Mr. Rocque's own words, as they carry great weight with them. "You muft not fow lucern without corn, unlefs your fpot of land is too fmall to ufe a harrow in: in that cafe, you muft fow it in drills, and keep it very clean hoed. The drills for fuch fmall fpots are to be ten inches diftant; if wider, it lodges in the drills. The reafon I recommend fowing corn with it, is, to prevent the weeds choaking it; but, you muft fow only for half a crop; otherwife your corn will be apt to deftroy your lucern, efpecially if it proves a wet feafon, and your corn is ftrong. If there is no corn fown amongft it, you muft be obliged to mow the weeds, and run a chance of cutting the lucern with them: and, being very fappy, you cannot imagine how detrimental it is to bleed it, when young; but, when the corn will be fit to mow, the lucern alfo may fafely be cut."

As the duration of lucern has been a queftion long agitated, and not, that I know of, finally determined, it will not be amifs to mention a fact related by this able cultivator, as it will be an encouragement to the planters of lucern.

"As to the duration, it will laft as long as the ground is kept clean. I faw fome at Mr. Middlemar's, at Grantham, in his garden, that was forty years old; and it was very fine. To keep it thorough clean, you muft harrow it every time it is mowed; and, if requifite, at Michaelmas, and in February and March. If you once leave it foul, it will be very expenfive to clean. You muft make ufe of the drill-plough; but let the harrow be ever fo ftrong, you need not fear its hurting it."

In my letter to you, above-mentioned, it is obferved, that in preparing land for lucern, a trench-ploughing would be of great advantage: but in the piece lately publifhed, Mr. Rocque fays, "In cafe you are not well acquainted with the ftate of your ground, you muft trench-plough it twice, according to the directions for ploughing, which are in my Hints upon Burnet; whereby the roots will run down the fooner out of the reach of dry weather: and if the foil, that is turned up, be ever fo four, future ploughings, harrowings, and manurings, will fweeten it fufficiently for the reception of the feed."

Mr. Rocque adds, in this place, that "Lucerne will grow very well in clay land, with provifo the ground works well. The difficulty in thefe lands lies in the harrowing; in dry weather the ground being fo very hard, the harrow can do but little good, unlefs you take the feafon between wet and dry to harrow it, which you certainly muft."

It is alfo obferved, that in the province of Languedoc, in France, the inhabitants mow their lucern when it is fix or feven inches high, in order to kill the annual weeds. Of this practice Mr. Rocque now fays, "By my own experience, I find they are in the wrong; for it bleeds it, fo that the plants make but little progrefs when cut fo young, and are a long time in recovering it. It ought never to be cut but when in bloom."

A great many imagine that the feed might profitably be faved in England; but Mr. Rocque is of a different opinion, and indeed I am inclined to join with him in this refpect, as in this ifland it is at beft but a precarious crop, and can be imported fo cheap, that the feedfman can afford to retail it at nine-pence per pound, at which price it was this year advertifed. Mr. Rocque's obfervation on this point is as follows: "In hot fummers the feed may be faved in England, but not from the firft growth, that being generally too rank, and fubject to rot at bottom: though I think it is needlefs attempting to fave any of the feed in England; for, in the year 1761, which was a very fine fummer, I tried to fave the feed of the fecond growth, on light land, but made nothing of it; not faving above thirty pounds of feed, upon four acres and a half. I alfo tried, that fame fummer, to fave fome off ftiff land; but that proved ftill worfe."

I have only now to give you Mr. Rocque's thoughts on the value of this grafs, which, in my opinion, deferves to be preferred to almoft all others.

This practical cultivator fays, "I have already obferved, it ought not to be cut but when it is in bloffom; and that is but three times a year: but after mowing the third crop, you may, inftead of mowing the fourth, feed it: but when frofts come, you muft take your cattle off; becaufe there are always young fhoots, which would be bruifed, if the cattle were not taken off. If it is rank in September, it is dangerous for cows, being too feeding; but turn horfes and fheep upon it. As there is no grafs, as has yet come to our knowledge, which gives the cows fo much milk, you may let them graze about an hour, at moft, in the afternoon, when the dew is off. When made hay, it is likewife the beft for milk: wherever it is much cultivated, they prefer it to all other kind of hay.

When I was at Monofque, a city in Provence, which was about twenty-feven years ago, the carriers fed their horfes upon it, preferably to any other, without corn; and the mules looked fat and in fine order. Six mules which I hired there, to carry my feeds at Nimes, fed on nothing elfe, and yet carried their load all day long, without unloading. They have the cuftom of hanging little bags to their horfes or mules heads, wherein they put lucern, on which they feed as they go.

It is acknowledged by all connoiffeurs to be the moft feeding of all pafture, either green or in hay. I truft not barely to report, but have experienced it to be fo myfelf. I had colonel Vernon's horfe fent to me from the country, in a very poor condition; and, in fourteen days, he was in very good order. The colonel was furprized to fee how he had throve in that fhort fpace of time.

Many are apt to condemn it, but it is for want of knowing its good qualities. It has been introduced for a long feries of years; but fo little noticed, that one and twenty years ago there was not two hundred weight of lucern grafs feeds to be fold amongft all the feedfmen here in London; and I had much ado to re-introduce it; but now, within thefe three or four years, there is a prodigious confumption of it.

One Mr. Beadle, a farmer in Kent, has fourteen acres of it, for which he had a premium. When I called upon him, which was in the beginning of May laft, he had mowed his lucern, and fold it upon the fpot, for three pounds or three guineas a load. I blamed him for cutting it fo young; but he told me he was compelled to it, to get fodder for eight hundred head of fheep, that he had; but that, a little while after, it grew fo faft, that he could turn his fheep upon it. Thofe that bought his hay muft needs be well acquainted with the goodnefs of it, to fetch it on the fpot, though they were ten or twelve miles diftant.

It is not foggy, like clover or tares. Horfes will work with it green, as well as with hay or corn: they do not fweat with it, as they do with other green fodder. I have been told, one of our poft-mafters kept his horfes both winter and fummer with it, and that his horfes were the beft on the road. They object, the hay of it is difficult to make: it is no more difficult than clover. All hay is difficult to make in wet weather: but when it is a bad feafon to make hay, do as Mr. Allen does; put it up

in

in ricks when dry, and between every bed of hay, of any kind, put a layer of falt, and that will recover all the damage the rain can have done.

I have done it myfelf, this very laft year, with a rick of burnet: to about twelve loads I have put a fack of falt amongft it; and every time my horfe comes near it, he eats it very eagerly, though he can get but at the outfide of it. It will keep in ricks as long as any hay.

Multitudes, at prefent, are pretty well acquainted with the excellence of both thefe graffes: but if any doubt the truth of what I affert, let them take the trouble to enquire into it, of Mr. Shennelly, the tobacconift, at Houndfditch; to whom I have fent a load of lucern, and am to fend another load of the fame, and half a load of burnet hay.

Thofe who are not fatisfied with the theory, may be convinced of the practical part, by feeing a field of mine of lucern, of four acres and a half, at Batterfea, and the manner of working the harrow."

From what has been faid on the fubject of lucern, I hope your farming readers will be induced to adopt the culture of it; as, if they are not blind to their interefts, they cannot but be convinced of the many advantages which would refult to them from fo doing. Mr. Rocque's method of cultivating this plant differs but little from the manner in which they raife clover; and the profit to the landholder will be abundantly greater. *Mufeum Rufticum, vol.* iv. *p.* 259.

The following method of cultivating lucern, is extracted from a very ingenious performance, entitled, *Effays on Hufbandry*, the principal intention of which is to recommend a newly difcovered method of cultivating this plant.

Mr. Rocque, as may be feen above, has adopted the old Roman method of fowing it, broad-caft, and harrowing the land from time to time by way of deftroying the weeds. Mr. Miller recommends the new, or drill, hufbandry for the culture of lucern; but the author of the Effays above-mentioned differs from both thefe practical cultivators, and raifes his lucerne in a nurfery; after which he removes the young plants, and having cut off their ftalks and tap roots, tranfplants them, with great regularity, into the field where they are to ftand for a crop.

I fhall not pretend to decide which is the beft method; yet I may venture to fay, that I know it may be raifed to confiderable profit, both in Mr. Rocque's way, and according to the rules laid down in the new, or horfe-hoeing, hufbandry.

I have no doubt but it may fucceed by tranfplantation; yet I greatly fear that the expences in this method will, when applied to any confiderable extent of land, greatly exceed the worth of the crop.

Thefe Effays being too learned for the honeft farmer's reading, it is very improbable they fhould ever fall into his hands; yet, as it is a great pity he fhould not be permitted to judge for himfelf in a matter which may turn out fo much to his advantage, we have taken the trouble of tranfcribing a few pages of the fecond Effay, which more immediately treats of the culture of lucern by this new method of tranfplanting.

In this extract we have omitted all reafonings that might render the narration obfcure to the farmer; not that we had ourfelves any objection to them, or did not approve of them, but as we were willing the honeft cultivator fhould have as much of this matter laid before his view, in a plain manner, as was neceffary for him to underftand it: when this is done, he may judge for himfelf; and if on trial he finds the method here recommended anfwer, his beft way will be to adopt it in his future practice.

Whoever propofes to fow a lucern-nurfery, or engages in any larger undertaking of cultivating whole fields of fainfoin, trefoil, buck-wheat, fpurrey, fenugreek, fweet, melilot, &c. would be no ways ill-advifed, if he prepared a bit of ground, and fowed a fpoonful of the feeds about a fortnight before he propofed to fow his larger quantity; fince, from the good or bad fuccefs of this little attempt, he may be enabled to judge, whether the feedfman has fupplied him with feeds fit for vegetation. Without fuch precaution, a whole year may be loft; which is a mortifying circumftance in matters of hufbandry.

In the end of March, 1757, a common day-labourer was ordered to fow a pound and a half of lucern-feed, and keep the ground clear from weeds. The feed was fown on one of the leaft promifing pieces of land in all the neighbourhood; but this was done by exprefs order; for it was thought unfair to make the experiment on a better foil than the commoneft fort of grafs-fields. The fpot of earth fet apart for the purpofes, both of nurfery and tranfplantation, was, in former times, a kitchen-garden: but the good foil, to the depth of eighteen inches, had been removed for the fake of manuring a corn-field. [To which we fhall juft add, that the attempt was made in an hilly country, where the ftaple earth is naturally fhallow.] What remained was a cold, yellow, clammy ftratum, which the country people looked upon as mere clay; but, its nature having fince been better examined, it appears to be a mixture of imperfect clay, and imperfect marle. No manure worth mention was ufed upon it, as will appear by the fequel.

To all feeming appearance, little, or next to nothing, could be expected from a piece of ground of fuch an unpromifing caft; but, upon the whole, the experiment proved fuccefsful and eafy.

By the middle of Auguft, the plants were, fome of them, eighteen inches high; and many of them branched out, fubdivided themfelves, and made very fine fide-fhoots: upon which it was refolved to venture upon the fecond part of the experiment, according to the accounts given by M. de Chateauvieux; therefore taking the advantage of a moift feafon, in the beginning of September, (which feafon, by the way, did not laft long) we performed the work in the following manner. [But here let it be juft obferved, in paffing along, that the time of the year, pitched upon for tranfplanting, was, at leaft, three weeks too late for England, though, perhaps, highly proper for the territory of Geneva, or the fouthern parts of France. This therefore is fet down as one of the *mutatis mutandis* fo indifpenfibly neceffary in matters of agriculture, when the practice of one country is copied in another.

Firft the roots were dug up carefully; orders being given before-hand not to attempt drawing them, even with the fmalleft degree of violence, till the earth was entirely loofened at top and at bottom. In the next place, the long tap-roots were cut off eight, nine, or ten inches, difcretionally, below the crown of the plant (the sciffars being generally applied juft beneath the forks of the root, if it be a branching root:) then the ftalks were clipped about five inches above the crown of the plant; and the remaining plant, after thefe amputations, (which may appear, at firft fight, to be very bold ones) was thrown into a large veffel of water which ftood by for that purpofe, in the fhade. Such refrefhment is no ways unneceffary; for this plant is very impatient of heat and funfhine after it is taken up; nay, to fuch a degree, (at leaft the firft half year of its growth) that one may almoft call it a fenfitive plant. The fame day, making ufe of a dibble, or fetting-ftick, and filling every hole with water before the roots are put in, we tranfplanted them in rows, two feet afunder, and each plant fix inches apart in the rows; having firft made little drills, or channels, and fprinkled, or half filled, them with fea-fand and wood-afhes kept dry (two parts of the former to one of the latter;) which was done with a view of loofening the foil, and giving a little warmth to a piece of ground which was naturally cold and clayey; nor was any other manure ufed. The drills were afterwards once watered, to take off the drynefs and heat of the afhes. The roots were placed firmly in the ground, and two inches of the ftalks covered with mould.

Yet here it muft be freely acknowledged, that the hopes of poffeffing a large crop occafioned one miftake, which we chufe rather to mention than fupprefs, as many people may happen to entertain the fame falfe expectances. The miftake was, that we made our rows two feet afunder, which was over-narrow; and placed the plants, in the lines, only fix inches apart, which brought them nearer together than they ought to have ftood, even though the ground was very poor: nor did we forefee, that horfe-hoe ploughing is five times more efficacious, as well as cheaper, than hand-hoeings.

Therefore,

Therefore, after frequent experiments, since made, it appears best to make the lines three feet four inches distant from each other: and if the soil is good, it may not be amiss to allow each plant a foot distance one from another in the lines, for thus the hand-hoers will work more commodiously, and a little hoe-plough may be guided safely up and down the intervals, which will save a great deal of trouble: nor will the future crops be lessened, by such thin transplanting, half so much as may be imagined; but, on the contrary, the plants will be larger, more juicy, and better tasted; which circumstance may be extended in favour of the New Husbandry in general. Space and culture improve the herbage and seeds of plants; in proof whereof I have been assured, from good authority, that all the corn, raised by M. de Chateauvieux, sells at an advanced price; being larger, brighter, and healthier than common corn, and, consequently, more fit for sowing, or making bread.

But, by way of confirming the necessity of allowing lucern roots a good share of space, a friend of the author's filled an acre with plants, according to the first directions; but, the soil proving extremely good, and free from weeds, it soon appeared that the roots stood too close: in consequence whereof, every other plant was taken up the next autumn, and, a fresh acre of land being properly prepared to receive them, he thus gained a new plantation of lucern, at a small expence, with little trouble: and, what is more remarkable, it is thought the second acre bore a larger quantity of herbage than the first would have done, if the plants had continued as they were, without being thinned, to the amount of one half. Of course, there is reason to conclude, that this slight hint, which took its rise from mere accident, ought not to be looked upon as quite unuseful, since two acres may be raised with almost the same expence as a single acre.

In ten days, though a drought succeeded, some transplanted plants made shoots of three inches height; which vigorous growth gave better hopes than had been conceived at first.

It was also some encouragement to the undertaker, that he found wild lucern within two musquet-shots of the place where the nursery was formed. These plants were certainly *aborigines*; for they grew in a part of the kingdom where the name of lucern had rarely been heard of, except by gentlemen. Besides, no person curious in husbandry would have ventured sowing the seeds in such an unpromising piece of ground; for the field, where the wild lucern grew, was a sort of coarse, uncultivated morass, and valued only at about two shillings and sixpence an acre.

Yet still the approach of winter made many persons doubtful concerning the success of this new plantation; nevertheless, it was some satisfaction to recollect, that there is less harsh, severe cold in England (and that almost by one third) than in the territory of Geneva, where the original experiment was made, and where the plant we are speaking of has been known to thrive so extremely well.

At length the winter passed over, and, out of four thousand roots, only thirty or forty perished, whether by frosts, immoderate rains, or any other accident, is hard to say: but the labourer filled up all the vacant spaces from the nursery in about an hour, and in April, 1758, most of the plants were nearly equal in size and strength; of a deep juicy verdure, with few or no discoloured sickly leaves: but, May the eighth, people counted sixty stems from one particular root, and the stalks and leaves of some chosen plants weighed near half a pound at one cutting. Yet we learn, by experience, that lucern must only be considered as in a progressive state, till the third summer after transplanting; and then M. du Hamel assures us, that one flourishing plant will produce a pound of well-dried hay; which is saying a great deal, and much more than I could ever verify; for, if a single plant produces one pound of hay, it must have weighed four pounds when it was green. Yet I have received an account from an eminent physician in our own country, (who planted two acres of lucern by my directions) that many of his plants, in the second year, yielded near half a pound of hay each plant.

As an acre of lucern, thus managed, will contain more roots than one is apt to imagine at first guess, how great must the produce be of four or five cuttings every year, and those confessedly the most nourishing and palatable food that cattle can eat! For thus much is certain, amongst other advantages, that, if a field be industriously hoed, ploughed in the intervals or spaces, and hand-weeded in the rows, for the first two or three years, it is almost sure, that horses, cows, or sheep, will hardly find a single weed in a large quantity of green food.

We will now mention the state of our transplanted lucern in its second year, namely, 1758.

And here let it be remembered, that what cultivators call a proper time for cutting is, when the plants are about fifteen or sixteen inches high, at an average, throughout the field: but this must be understood in a relative sense, for some plants will be two or three feet high, and others may not be above ten inches, or one foot, in height, according to the circumstances of health, space, situation, &c. of the several roots.

The cuttings of the year 1758 were as follow: May 8th, June 7th, July 12th, August 20th, and October 1st.

In the year 1759, it was cut five times, and six times in 1760; which made sixteen cuttings in three years. Nay, by the ninth of April, in 1760, some of the lucern plants were near seventeen inches high, at a time when no field in the neighbourhood had grass of four inches height, though you took five or six acres together. The same lucern was cut twice, before any hay-making began in the country round it, if we except some few meadows lying near market-towns.

Having carried on my first experiment thus far, upon almost as unpromising a piece of land as could be found, and being sensible I had made some mistakes from want of experience, (having as yet never seen any transplanted lucern in England) I gave directions for making a small plantation in Berkshire, but still took care to chuse a field that could hardly be called middling land. It was overrun with coarse weeds, had been long out of tillage, and the earth, in most places, was hardly four inches above a bed of chalk; which (let farmers say what they please of it, in respect to saintfoin) is no ways favourable to the growth of lucern, especially if the latter be transplanted; for the chalk flakes, when thaws and rains come on; and it either heaves the plants out of the ground, or exposes the fibres of the roots too much to the cold. Yet upon this I ventured with my eyes open; for Pliny (whose authority I scruple not to take, when I have no other) had given me a caution concerning lucern raised upon chalky lands: but what induced me to make the attempt was, that the goodness of the soil might not lead me to say more concerning the success of an experiment than other people may hope to find.

The little field, or close, consisted of one rood of ground, or a quarter of an acre; which we threw into fifty-four rows, each row containing one hundred and ten plants, or five thousand nine hundred and forty in the whole. In the second year after transplanting, (and lucern is not then arrived to its due size) and at the first annual cutting, (which is not the best cutting, as the herbage suffers much from the winter) I weighed, out of curiosity, a parcel of the prime plants, which, one with another, weighed about one pound and a quarter each. But supposing that every plant weighed only one quarter of a pound, and admitting we give up the sixth cutting, (which is more than one needs to do) then the crop of forty perches, or one fourth of an acre, amounts to a very considerable return of ten tons, at least, of green lucern per acre.

An acre of transplanted lucern, rightly managed, will bring in five pounds a year, free and clear from all expences, and that for a considerable tract of time. Now certainly this advantage deserves well to be considered; for the husbandman is said to be a good manager who makes three rents each year; a first for the landlord, a second for labour, &c. and a third for himself: but an acre of lucern will for several years produce five rents, clear of all out-goings for rates, rent, workmen, manure, &c. supposing the land to let at fifteen shillings an acre, as usually happens in most estates that lie at some distance from cities and market towns. On the contrary, if land be dearer near rich populous places, the ground will be better, and the produce more advantageous. This gives lucern its value near towns and cities, where two or three acres may be rented, but ten or twenty cannot; and sure it is some advantage in husbandry to make one acre supply the place of two or three, and especially where it is difficult to rent land, even at a very high price.

It is certain, that the profits arising from transplanted lucern have been no ways exaggerated in my account; for by some collateral observations it may be easy to carry the value of an acre something higher than has been here represented. Suppose green vetches (which are rarely cut more than once) and green lucern to be of equal value as food for horses (which is making a supposition no good writer on husbandry will allow to the disadvantage of lucern;) now a perch of green vetches (if the crop be good) sells for sixpence at seventy miles distance from London, and a perch of transplanted lucern will weigh as much, or very nearly as much, at two cuttings, out of the four or five annual cuttings; which (every circumstance being duly considered) brings an acre of lucern (to say the least of its advantages in husbandry) to be of equal value with two acres and a half of vetches; not to mention that lucern is a perennial plant, and vetches are annual; which, upon the whole, makes a new difference in point of profit.

As I think it unfair to suppress any unsuccessful circumstances in matters of husbandry, I will here ingenuously confess, that the most material of my mistakes were these: I followed my foreign instructions (which, at that time, were but few) with too much diffidence, and in too literal a manner. I was not enabled, through want of experience, to adapt the husbandry practices of other nations to the English climate. I transplanted too late, filled my rows too full, and allowed not sufficient space for the intervals. By following the French directions over closely, I cut the tap-roots too short in the best plants, and knew not (as it is a point unmentioned by any cultivator of lucern) how to manage a root that was very small. The means of avoiding and rectifying all which mistakes and difficulties are, by the help of subsequent experience, carefully pointed out.

And here it may be worth considering how to apply a field of lucern, carefully and industriously cultivated, to the greatest advantage. In such a case, let us suppose the plantation to consist of two acres, and that four large horses are to be supplied with green fodder, from the end of April till Michaelmas. Now, in order to manage this affair with dexterity, count the number of rows or lines in the lucern field, and place in one of the head-lands thirty land-marks, at equal distances; and thus, having cut a proper portion, day by day, you will be ready to begin afresh, after the last cutting.

When I say you will be ready to begin afresh at the end of thirty days, I must desire to be understood, with a small degree of latitude: for physical accidents are so numerous and unavoidable in regard to the growth of plants, (though lucern is liable to fewer checks and miscarriages than most other cultivated field vegetables) yet still the nature of the thing will not allow us to predict the time of each and every periodical cutting with much certainty; nevertheless, thus much may be depended upon, even for some years successively, that, after the first annual cutting, our directions, here given, will be attended with no inconvenience to the owner; for there will rarely be more than three or four days difference between the times of the second, third, and fourth cuttings: nor will the want of lucern fodder, during such short intervals, be of the least ill consequence; for, surely, that husbandman must be a very improvident manager who has not other grass fields by way of a momentary supply.

The times, therefore, of the second, third, and fourth annual cuttings, are tolerably certain; but the first cutting, according to the nature of the winter, may be accelerated, or retarded, a fortnight, three weeks, and, perhaps, a month.

The time of the fifth cutting is also, in some degree, variable and uncertain, as the solar heat decreases, and the days grow shorter. A sixth cutting, which is seldom of much consequence, chiefly depends on a fortunate season, in conjunction with the industrious good management of the cultivator.

From this succession of fresh green food appears one singular advantage in raising lucern: and in the next place care must be taken, that your plantation be always proportionable to your number of cattle; or, in other words, let it be a rule to you to have rather over much lucern, than too little; for then one cutting may be set apart for hay, which may be given occasionally to favourite horses and sick cattle. But, in case no hay is made, the owner of the ground, even then, by means of the supplies he derives from green lucern, will be enabled to spare a large quantity of other grass for hay-making; and thus two acres of lucern will give him the power of saving two or three tons of hay more than he could have saved otherwise; consequently lucern, in effect, helps to keep cattle both in winter and summer.

By such sort of husbandry, and provident management, the stock of hay for winter will be considerably encreased, and the owner enabled, for the space of five months at least in the other parts of the year, to allow his horses very nearly the same quantities of green food each day; all equally fresh, wholesome, and well tasted: which single circumstance, (if it related to horses only) gives lucern the preference over all other sorts of green fodder hitherto known, and in process of time may be applied (as has been experienced with much success) to the fatting of horned cattle, provided such cautions are used as shall be specified hereafter, and which ought always to be remembered. Now whatever encreases the number of cattle, augments the quantity of dung necessary for carrying on the more successful cultivation of arable lands; and whatever, by multiplying the number of cattle, affords more animal food to man, will of course contribute towards lessening the price of meat, which will assist society in general, and more particularly the manufacturer and peasant; for the grand secret of well-managing a trading populous country is to supply the inhabitants with flesh and corn upon easy terms; for then mankind will multiply of course (supposing the government to be mild and equal;) nor will other nations undersel us in the commodities we export to foreign markets.

Now lucern, in matters of husbandry, comes the nearest of any article yet known, towards attaining the points here proposed; forasmuch as one acre of land, thus cultivated, will support as many cattle in spring, summer, and a part of autumn, as four acres of common, natural, upland grass did before. But this use of lucern is greater, if land be scarce; or if the nation be populous, and the soil has been cultivated to the extent of the old husbandry: for then the introducing this plant is, in effect, the same as creating new land, if the superior produce of lucern, both in quantity and quality, be fairly considered by us.

Yet one thing must be well understood in the new practice of raising lucern. Negligent husbandmen, and such as expect good crops without labour, expence, frequent ploughings, weedings, &c. would act a wise part in not attempting to cultivate the plant here mentioned: nor is it advisable for gentlemen of fortune to commit this part of husbandry to bailiffs and servants, who (be their masters advantage ever so great) will not like the labour (though they are well paid for it) of turning fields into a sort of gardens, and, besides all this, may conceive a prejudice against improvements, and take some small delight to see them miscarry: so that all random, careless, and insincere methods of culture must have nothing to do with raising plants, which, though hardy and long-lived after they attain a certain age, yet are surprisingly delicate and tender when they are young, or when first transplanted; and more especially if wild couch-grass and other weeds should spring up amongst them.

For these reasons, at first setting out, I must advise every good cultivator to be particularly industrious in the extirpation of weeds, and that he over-burdens not the strength of the earth from a principle of avarice, but allows her the just refreshments of manures, and gives her at least some breathing space of ease and repose.

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It is highly unreasonable to expect success in the management of this plant without care, and highly improbable (if the seeds are good) to miscarry with due care. It is true, many people have failed in the process of this experiment; but then one is generally enabled to point out the error, as likewise the cause of ill success, with tolerable exactness. To begin well in cultivating this plant is doing but little; rules and directions must be cautiously observed for three, or two years at least. Few people make mistakes in the beginning of an experiment: but, generally speaking, after three or four months are expired, the master's attention and keeness wear off, and the bailiff or gardener, (as sometimes the raising of a lucern nursery fall in the province of the latter) are extremely glad not to refresh his memory: for the ones does not like an additional trouble out of his department (a punctilio which has great weight with all servants;) and it is a maxim with the other, never to admit any thing new in matters of husbandry, but admire those sorts of crops which Columella describes; crops that can hold up their heads and prosper under all the negligence of a pretending cultivator.

It is true, many difficulties and discouragements attend making experiments. The continuance of life is as short as that of art is permanent; and few husbandry experiments can be made oftener than once in a year: nor must we reason too much by analogy, from success in one production, to success in another of a different species. Attention also is required, and that even to the minutest circumstances: and again, too many experiments die with the observer; which, though highly useful, did not appear considerable enough for human vanity to establish a system thereon.

Yet still all these difficulties and discouragements may be counter-balanced by the advantages which result afterwards to society.

Lucern cannot easily be freed from manifest disadvantages by any other method of culture than what is here recommended. That it has usually miscarried, when sown with spring-corn, after repeated trials in this kingdom, from the year 1577 to 1764, is well known to many readers; for common wild grass, and particularly couch-grass, may be called its destruction, if not its poison, principally indeed by starving the roots of it, but probably from its effluvia too. This likewise I have always observed in plants of a different species that stand too near each other; they immediately, as it were by a declaration of war, contend for mastery: the roots are constantly attempting depredations and encroachments upon each other; whilst the stalks, especially those of weeds, make the same efforts in longitudinal shoots; and that plant, which over-tops the other, provided the shoots are equally thick and strong, always gains the victory, and, by over-shading and dripping upon its antagonist, forces it to dwindle away and perish. This struggling for life and mastery draws up the plants too weak and spindling, and the conquered plant usually dies. Now weeds, generally speaking, are more hardy, savage, and hungry, than manured vegetables. If such be the case, where is there a country to be found that abounds with foul grass and weeds more than England? So that, if lucern be sown in the usual way amongst corn, like ray-grass, clover, and hop-trefoil, no care can keep an acre clean. It may last two years, (only one crop being tolerable) and then must perish in the common course of nature. A gentleman very lately made this experiment (in good measure against his judgment) for the sake of farmers, in hopes of finding out a cheap, easy, and compendious method of raising lucern; but the crop, at the end of fifteen months, was as near being overpowered and starved as can be imagined; which made him venture to take up and transplant the few good roots that remained, which, being freed from the bad neighbourhood and incumbrance of coarse grass and other weeds, appeared to prosper very well. Again, if lucern be raised in drills, according to the best directions hitherto given by our ingenious countrymen, Tull and Miller, (who, to do them justice, were the first persons, amongst our modern writers, that saw the great advantage of this grass, and pressed the culture of it strongly on the English nation) certain it is, that such a method will greatly exceed the promiscuous sowing of lucern with spring-corn. Yet still, in the practice of drilling, a considerable part of the seeds may be faulty, and then the rows will appear naked and unsupplied with herbage: nor can the hopper be supposed always to drop the little grains at precise distances plant from plant. Nevertheless, such persons as prefer drilling may fill up all the vacant spaces with transplanted roots.

In the method of cultivating lucern, which is here recommended, an acre will be found to contain about such a number of chosen healthy roots as the ground is capable of supporting, and admit a greater number of them than the reader will be apt to imagine, *prima facie*; for it will hold, according to my first experiment, about twenty-six thousand plants: but, if the ground be clean, rich, and well conditioned, it may be more advisable to observe the greater distances already mentioned; upon which principle, the acre will contain about thirteen thousand plants; and this is the number, all things considered, I am most inclined to recommend; for the produce of such an acre will be full as large and profitable as the former, and the ground will be managed with less expence and more convenience.

It may be observed farther, that, in transplanting lucern, there will be one advantage (and that no small one) which can never be obtained in drilling, or promiscuous sowing; each root will stand at a proper distance from its neighbour, and receive its allowance of food in due quantity, without diminution. In the next place, you will seldom see a plant wanting, and rarely (except by mistake) a plant supernumerary: but, if a few sets should chance to die, it will be easy to supply the vacant spaces from the nursery, and that, as people find by experience, in any moist day, from April till the middle of September.

There is another advantage which arises from transplanting lucern; for, by cutting the tap-root, you prevent its penetrating ten or twelve feet perpendicular into the ground, which the plant naturally does in three or four, years, except it be obstructed by a stratum of rock, or chilled at root by weeping springs, or finds admission in a bed of cold watery clay. Then the crop makes a poor appearance, or, perhaps, goes off all at once.

People who hand-hoe or horse-hoe lucern, need not give themselves much pain about breaking or cutting off a lateral root accidentally; not but that some care and caution must always be used: however, what seems to injure the parent-plant proves, in the end, no-ways disadvantageous to it; for horizontal, or side roots, thus cut, or broken, push forth new roots and filaments laterally; and thus the suckers, or tubes that suck nourishment, are multiplied by a cause which had the appearance of lessening their number. Yet transplanted lucern will no-ways bear such rude treatment as the antients sometimes gave to untransplanted lucern, when they thought fit to make it undergo the discipline of harrowing.

How long lucern may last cannot be known by the experiments which are here related, namely, from the spring of 1757 to the beginning of the year 1764; but some persons of credit have observed the plants to continue in good strength and health near twenty years. [I suppose they mean here and there particular plants, and not a whole plantation.] Tull, indeed, tells us that, except lucern be choaked or starved by grass and weeds, he hardly knew when to say it will die a natural death; and probably it may not prove the less long lived for being transplanted; since hand-hoeings, horse-hoeings, and digging, will give new strength and health to the plants. The spreading of the roots will be facilitated by loosening the soil, and letting in the good influences of the atmosphere: their growth also will be augmented by giving them that additional nourishment of which the weeds defrauded them: and, in the last place, all manures will more easily reach them; for thus much is a certain fact in husbandry, that, when the ground is rendered clean, light, and penetrable, the roots love to expand themselves, in order to procure a greater quantity of nourishment.

I fairly acknowledge that I am not enabled, from my own experience, to fix the common duration of lucern, whether transplanted or drilled (and that from no difficulty in the thing itself, but because a sufficient number of years has not elapsed since making my experiments;) but thus much I can take upon me to say, from my own knowledge,

ledge, that lucern fown at random, or by what we call promifcuous fowing, as the ploughman fows rye-grafs and clover, (whether with or without fpring-corn) will not laft to any tolerable purpofe above two years, or three at moft. But, as this plant is of the greateft ufe and value, where land is dear and fcarce, as near cities and towns, I fee no reafon to doubt, but that the fame fpot of ground may be continued as a lucern plantation for half a century at leaft: for if the rows are three feet four inches wide, (which I look upon to be a *fine qua non*) then, whenever the old lucern decays, new lines may be planted in the middle of each interval, which has lain fallow, and alfo been manured and pulverized for a confiderable number of years; and thus progreffively, *vice verfa*, to a long continuance.

Not being able therefore to give pofitive fatisfaction concerning the continuance of lucern rightly managed, I fhall propofe fomething that is not merely a query, and which, perhaps, may give the reader an equivalent information. In a few words, it is as follows: when lucern is grown old, and the owner propofes to break up the plantation, layers might be made from all the principal ftalks, and removed into frefh ground. Thefe layers, in all probability, may fucceed extremely well, according to fome few experiments made abroad in the years 1755 and 1756.

As to the expence and rifque of cultivating fmall quantities of ground, agreeably to the method here laid down, it is to be hoped that curious gentlemen will not be deterred by fome few minute difficulties or objections, but give the prefent experiment fair, patient, and repeated trials; for neither the out-goings nor the hazard will be very confiderable. But at prefent it is no-ways our intention to perfuade farmers (at leaft fuch as are in low circumftances) to quit their little certainty for an advantage which may appear to them quite uncertain.

Let them wait, at leaft for a few years, in hopes fome cheaper and more compendious method may be difcovered for their fakes; and if, at prefent, they make any experiments, let them be in fmall.

The firft point of confideration, when I undertook to recommend tranfplanted lucern to the public, from my own experiments, was to bear conftantly in mind whether the profit counterbalanced the expences and labour of culture, and that in a double, or even treble, proportion; fince, otherwife, I was doing little more than poftponing utility, for the fake of introducing a new fort of hufbandry, which only deferved to be called ingenious.

We all know that the farmer expends much money, and gains very little from a crop of wheat at the expiration of his twelve months; but if we take ten years together, and compare the profits of lucern on the one hand, and wheat, barley, oats, and clover, on the other, the balance will certainly turn in favour of the lucern-crops, and that in a proportion of three, or two, to one, at leaft.

The expence of raifing an acre of lucern in the manner which we recommend, (and fuppofing even digging to be made ufe of inftead of ploughing) amounts, as nearly as I can remember, to the following fums:

	l.	s.	d.
Fine-digging and picking thirty perches for a nurfery	0	12	0
Seed	0	7	0
Hand-weeding the nurfery twice, and tranfplanting into vacant patches fuch plants as ftand too thick.	0	13	0
Digging an acre for receiving the roots	2	10	0
Tranfplanting	1	5	0
Hand-weeding and hand-hoeing the rows, with a four-inch hoe that cuts downwards, and then with a larger plantation-hoe which cuts horizontally	1	0	0
Two horfe-hoeings	0	5	0
Total	6	12	0

It is true, the expences of raifing lucern, in this manner, will vary, when applied to parts of England different from thofe where the experiment was made, as the price of labour may be dearer, and rents run higher; but then the ground ought to prove better, which will balance the difference.

This plantation of lucern may be cut three times the firft year after tranfplanting, as fome repayment for the out-going expences: next year the profit will be more confiderable.

On the other hand, thofe who prefer the drill-method of raifing lucern, as lefs expenfive, may feem to fave about two pounds, or more, upon an acre, at the firft appearance of things; but then the rows, in cafe the crop fucceeds (which is a doubtful point) muft be thinned with good judgment, which will coft money; and the vacancies in them muft be filled at laft with tranfplanted roots: nay, M. de Chateauvieux afferts, that drilled lucern will rarely be fo large and flourifhing as the tranfplanted; for the effects of horfe-hoeing, and the influence of manures, may prove of lefs fervice to the roots of the former, at a depth of twelve or thirteen feet, than to the roots of the latter, whofe fineft imperceptible fibres will hardly defcend above a yard perpendicular.

It is hard to fay at what precife time the affiftance of the hoe-plough fhould be called in: but the owner of the plantation may venture on the attempt, I think, with fafety, in three days after the fecond cutting, about the beginning of June; for the roots then will be tolerably well fettled in the ground, and before that time the flat plantation-hoe may be ufed, chufing fuch an one as is about eight inches and an half wide in the cutting part.

As continued hand-hoeings will be chargeable, troublefome, and almoft endlefs (being in truth little more than a temporary expedient, and flight fcratching the furface of the earth) remember to make a light plough, with which you are to cultivate the fpaces between the rows; and in this cafe you may either invent a plough according to your own fancy, or copy fuch as are ufed at home, or in other countries, on the like occafion.

The fhare of this plough fhould be fharp, about fixteen inches long, with a coulter proportionable; the plough itfelf no heavier than a ftrong lad of fifteen years of age can carry: and thus one horfe, after fome obftructions of no great confequence in the firft attempt, will afterwards draw it with eafe. Yet ftill the trouble will be leffened, if the field be prepared by digging and picking up the roots and ftones, inftead of common ploughing, juft before the ground is to receive the tranfplanted roots: therefore, after a full fecond confideration, the former practice is recommended preferably to the latter; and if the lucern ftands nine or ten years, the difference of the expence will not be perceived.

As the rows will be one yard four inches afunder, there will be room fufficient to guide the plough fafely along the intervals, and yet no room to fpare: it behoves the ploughman therefore to be extremely careful in the flice he cuts next the lines: fuch a ftroke muft be a fhallow and a dexterous one; nor muft he approach too nearly. A man, an horfe, and a boy to lead the horfe, will manage an acre in a day, when they know their bufinefs; for it is more a matter of nicety than fatigue, fince the ground ploughed in an acre will hardly exceed half an acre.

After the firft time of ufing the horfe-hoe plough (which a man's own difcretion, upon confidering the ftrength of the plants, will beft determine) it may be laid down for a general rule, that it will be always found moft convenient to horfe-hoe the intervals (as long as the plantation ftands) the third day after each cutting; for by that time the new fhoots will make the plants vifible, nor will any fide-branches ftand in the plough's way.

It may be proper alfo to hand-weed the lines once a year; and the larger weeds may be taken up expeditioufly with the three-pronged fpade, or the field-fpade.

We will now confider the expences of an acre of lucern the fecond year, which will ftand as follow:

	l.	s.	d.
Clearing the lucern-plants from weeds in the rows by hand	0	8	0
One hand-hoeing of the intervals	0	8	0
Four horfe-hoe ploughings	0	11	0
Compoft-dreffing for manure, or foot, or wood peat afhes, at an average per year	0	10	0
Difperfing the manure	0	3	0
Total	2	0	0

Such

Such will be the yearly charges, or in ſome proportion very like them, during the continuance of your lucern, which I fix at a medium of ten years: M. de Chateauvieux ſays it may laſt twenty; and Pliny goes as far as thirty; though the expreſſion may be looked upon to be exaggerated.

In regard to manuring lucern, it may ſuffice to ſuggeſt here in general terms, that if the ground be ſtiff, cold, and of a clayey tendency, then wood-aſhes, ſoot, and lime, are proper dreſſings. If the ground be hot, ſhallow, and braſhy, a compoſt of calcined clay, dung rotted to a fine mould, and pond mud, long expoſed to ſun and froſts, and frequently turned, may have its uſe: and if the ground proves of a middle nature, then malt-duſt will not be amiſs. All theſe manures are eaſily procured, and therefore we have mentioned none that are ſcarce and dear: but as variations of ſoil are infinite, and few people know the true nature of any field (eſpecially if it be of the mixed kind) we recommend the compoſt dung-hill, as the ſureſt and moſt univerſal aſſiſtant upon ſuch occaſions.

Many other manures may be good for lucern, but dung probably is not one of the beſt, except it be very old, and well corrected with proper mixtures of a ſweet, as well as fertilizing nature, ſufficiently warm and cheriſhing, but noways rank; for dung (eſpecially if it be new) produces in general very luxuriant, troubleſome weeds, inſects in abundance of various kinds, and gives the graſs a foul, cloying, putrefied taſte.

The owner's eye, it is true, may be deceived, and his hopes encouraged by the largeneſs of the crop; but the ſagacious four-footed animals will diſtinguiſh better than we can pretend to diſtinguiſh; and if they could preſent a petition to their maſters, as the white heifers are reported once to have done to the emperor Julian, they would remonſtrate not a little againſt the immoderate uſe of this manure. Nevertheleſs, aſſertions like the preſent ought to be confirmed by ſome proof: an experiment therefore was made upon four acres of graſs-ground, of which one half was dreſſed with ſtable dung, and the other with wood aſhes kept dry. The former moiety appeared the moſt rich and luxuriant of the two, but the cattle always neglected it, till they had bitten the latter down to the bare earth.

Having thus given the reſult of my experience in regard to dung as a manure for lucern, I ſhall ſubjoin only one ſhort caution, which is, that no dung, not even of the beſt kinds, muſt be ſpread on a lucern plantation, till it be two years old at leaſt.

In all grounds inclinable to moiſture, and ſuch particularly as are of a clayey caſt, it is pretty certain, that the preference ought to be given to ſoot-dreſſings, and, after ſoot, to chimney-aſhes (thoſe of green wood eſpecially) provided they are houſed and ſecured from wet; then ſoap-boilers aſhes may take place, coal-aſhes well ſifted, charcoal aſhes, and malt-duſt; nor might the aſhes of lime be amiſs, nor lime itſelf, when mixed with ſuch fine mould as may be found under a ſhort ſweet turf, in lanes or commons. The compoſt-dunghill alſo, as obſerved before, ſhould be applied to, which, at the end of twelve months, having been thrice turned, will ſpread almoſt as well as aſhes or ſoot: nor will ſuch compoſt want ſtrength when it is rightly managed; for if the dunghill be moiſtened at times with the brine, ſoap-ſuds, diſh-waſhings, and chamber-lie, &c. of the family, then, when it is removed into the fields, the ſharp, pungent, ſtrong ſalts, which fly off, will make the labourers ſneeze, and occaſion a ſmarting in their eyes.

When you manure lucern with ſoot, dry chimney-aſhes, lime, ſoap-boilers aſhes, &c. it is ſufficient to dreſs the rows only, becauſe theſe finer ſorts of manures may be diſperſed in the niceſt exacteſt quantities, if ſown in the Berkſhire manner, with a peat-aſh ſpoon; but if coarſer manures are to be employed in larger quantities, as old dung, marle, compoſt-dreſſings, &c. I would then adviſe the proprietor of the field to manure the intervals and rows promiſcuouſly.

Nothing can be more cheaply and eaſily managed than manuring lucern with ſoot-dreſſings; for the labourer, if he makes uſe of a peat-aſh ſpoon and ſeed-lip, may ſprinkle the rows of an acre in four or five hours, walking down the firſt interval and returning by the ſecond, and ſo progreſſively.

Aſhes may be ſown in the ſame manner.

It may not be amiſs to anſwer a couple of queſtions which have been often propoſed.

The firſt queſtion is, How, and in what manner (by way of reſult from the conſiderable number of experiments made by me) I would adviſe any gentleman to prepare three or four acres of land for receiving lucern? this being an undertaking of ſome moment.

The ſecond queſtion is, How to perform this work in the ſhorteſt, ſafeſt, and moſt œconomical manner? Concerning both which points my ideas are as follow, this only premiſed, that I am here endeavouring to make the expence of the undertaking as cheap as poſſible; otherwiſe, where people pay no regard to to a few incidental charges, I would recommend Mr. Boyle's method of preparing a field for receiving tranſplanted lucern, who began his experiments of lucern in the ſame year that I did, but proceeded upon a larger ſcale; for he undertook the culture of ſix acres at once.

His preparation of the field was as follows:

In the year 1757, he gave his field a ſummer fallow, and having thoroughly ploughed and harrowed it (not as farmers underſtand theſe words, but effectually, inſtead of ſuperficially) he ſowed wheat after the ground had been dreſſed with lime. In 1758, his crop of wheat was very great. Immediately after harveſt, he gave the land in queſtion a ſevere diſcipline, uſing every method for pulverizing the earth, and extirpating weeds, that the beſt huſbandmen are acquainted with, either in our kingdoms or abroad; ſo that the field appeared again a perfect fallow. Then ploughing it very narrow and ſharp, he made water thoroughs with the plough, and left it in this condition for the winter 1758.

In ſpring 1759, he made many French drains in the field, as before he had made open ones for the winter; and, by ſtone-picking the land, had nearly ſtones ſufficient to fill them. In March the ſame year (taking advantage of the firſt fine weather) he ſlit the ridges with the plough, and reduced the land to the fineſt tilth he was able, and tranſplanted the lucern from his nurſery in autumn; in the whole proceſs of which he followed Du Hamel exactly.

Nothing in huſbandry could be more ſenſible and maſterly, than this preparation of a large piece of land for receiving lucern.

In the preſent caſe it may ſuffice to ſay, that ſuppoſing the nurſery to be properly prepared, and the ſeeds ſown in the firſt week of April, before the ſeaſon for tranſplanting, according to directions already given; I would recommend a field in good tilth, after barley harveſt, and before oats have been ſown in it. This field ſhould be thoroughly ploughed and harrowed twice, which we will ſuppoſe to be, for example, in the autumn of the preſent year, 1764. After each ploughing and harrowing, there ſhould be a very diligent burn-beating. But if the ſeaſon ſhould prove too wet at the time of a ſecond burn-beating, we make a virtue of neceſſity, and the weeds and trumpery muſt be raked together and carried off.

Then give the field a trench-fallow ploughing for winter, and early in March, 1765 (if the weather anyways permits) having manured your ground as the relative nature of the ſoil requires, and ploughed and harrowed it again to an exquiſite fineneſs, drill in a crop of field-peaſe, as early in the ſpring as is convenient with prudence and ſafety; for this crop muſt be ripe, and removed, by the laſt day of July. Much depends upon this point of foreſight: however the peaſe, by ſtanding thinner than in hand-ſown promiſcuous crops, being at the ſame time banked and hoed with greater eaſe, and enjoying more room, free air, and ſun-ſhine, will, in all probability, gain an advance of ten days at leaſt in their ripening. This will be a great point ſecured; for it is in huſbandry as in war; there are critical moments, which never preſent themſelves a ſecond time in the ſame campaign.

This pea-crop being hacked, and moved from the field by the fourth or fifth of Auguſt, call in all the aſſiſtance you have of huſbandry-ſtrength, or can procure, and plough and harrow the field, and burn the pea-roots, weeds, &c. as often as you have time, before the twentieth of Auguft; and then (your nurfery being fuppofed to be in perfect readinefs) tranfplant your roots as before directed, and contrive to clofe your work by the end of the month."

Mr. Lullin de Chateauvieux has obliged the world with many valuable experiments on the culture of lucern, which muft not be omitted here: but it may not be amifs to give firft Mr. Miller's directions for cultivating lucern, as it has been often mentioned in this article. They are as follows:

"After having well ploughed and harrowed the land very fine, you fhould make a drill quite acrofs the ground, almoft half an inch deep, into which the feeds fhould be fcattered very thin: then cover them over a quarter of an inch thick, or fomewhat more, with the earth: then proceed to make another drill, about a foot and a half from the former, fowing the feeds therein in the fame manner as before, and fo proceed through the whole fpot of ground, allowing the fame diftance between row and row, and fcatter the feeds very thin in the drills. In this manner, an acre of land will require about fix pounds of feed; for when it is fown thicker, if the feeds grow well, the plants will be fo clofe as to fpoil each other in a year or two, the heads of them growing to a confiderable fize, as will alfo the roots, provided they have room. I have meafured the crown of one root, which was in my poffeffion, eighteen inches diameter, from which I cut near four hundred fhoots at one time, which is an extraordinary increafe, and this upon a poor dry gravelly foil, which had not been dunged for many years, but the root was at leaft ten years old; fo that if this crop be well cultivated, it will continue many years, and be equally good as when it was firft fown: for the roots generally run down very deep in the ground, provided the foil be dry; and although they fhould meet a hard gravel a foot below the furface, yet their roots would penetrate it, and make their way downward, as I have experienced, having taken up fome of them, which were above a yard in length, and had run two feet into a rock of gravel, fo hard as not to be loofened without mattocks and crows of iron, and that with much difficulty.

"The reafon for directing this feed to be fown in rows is, that the plants may have room to grow; and for the better ftirring the ground between them, to deftroy the weeds, and encourage the growth of the plants, which may be very eafily effected with a Dutch hoe, juft after the cutting the crop each time, which will caufe the plants to fhoot again in a very little time, and be much ftronger than in fuch places where the ground cannot be ftirred: but when the plants firft come up, the ground between fhould be hoed with a common hoe; and if, in doing of this, you cut up the plants where they are too thick, it will caufe the remaining to be much ftronger. This hoeing fhould be repeated two or three times while the plants are young, according as the weeds are produced, obferving always to do it in dry weather, that the weeds may the better be deftroyed; for if it be done in moift weather, they will root and grow again.

"With this management, the plants will grow to the height of two feet or more, by the beginning of Auguft, when the flowers will begin to appear, at which time the lucern fhould be cut, obferving to do it in a dry feafon, if it is to be made hay, and keep it often turned, that it may foon dry, and be carried off the ground; for if it lie long upon the roots, it will prevent their fhooting again. After the crop is taken off, you fhould ftir the ground between the rows with a hoe, to kill the weeds, and loofen the furface, which will caufe the plants to fhoot out again in a fhort time; fo that by the beginning of September there will be fhoots four or five inches high, when you may turn in fheep upon it to feed it down: nor fhould the fhoots be fuffered to remain upon the plants, which would decay when the frofty weather comes on, and fall down upon the crown of the roots, and prevent their fhooting early in the fucceeding fpring.

"The beft way therefore is to feed it until November, when it will have done fhooting for that feafon: but it fhould not be fed by large cattle the firft year, becaufe the roots being young, would be in danger of being deftroyed, either by their trampling upon them, or their pulling them out of the ground: but fheep will be of fervice to the roots by dunging the ground, provided they do not eat it too clofe, fo as to endanger the crown of the roots.

"In the beginning of February, the ground between the rows fhould be again ftirred with the hoe, to encourage them to fhoot again: but in doing of this you fhould be careful not to injure the crown of the roots, upon which the buds are at that time very turgid, and ready to pufh. With this management, if the foil be warm, by the middle of March the fhoots will be five or fix inches high, when, if you are in want of fodder, you may feed it down till a week in April; after which it fhould be fuffered to grow for a crop, which will be fit to cut the beginning of June, when you fhould obferve to get it off the ground as foon as poffible, and ftir the ground again with the Dutch hoe, which will forward the plants fhooting again, fo that by the middle, or latter end of July, there will be another crop fit to cut, which muft be managed as before; after which it fhould be fed down again in autumn: and as the roots by this time will have taken deep hold in the ground, there will be little danger of hurting them, if you fhould turn in larger cattle; but you muft always obferve not to fuffer them to remain after the roots have done fhooting, left they fhould eat down the crown of the roots below the bud, which would confiderably damage, if not deftroy them.

"In this manner you may continue conftantly to have two crops to cut, and two feedings upon this plant, and in good feafons there may be three crops cut, and two feedings, which will be a great improvement, efpecially as this plant will grow upon dry barren foils, where grafs will come to little, and be of great ufe in dry fummers, when grafs is often burnt up: and as it is an early plant in the fpring, fo it will be of great fervice when fodder falls fhort at that feafon, when it will be fit to feed at leaft a month before grafs or clover; for I have had this plant eight inches high by the tenth of March, old ftyle, at which time the grafs in the fame place has fcarcely been one inch high.

"That cold will not injure this plant, I am fully fatisfied; for in the very cold winter, anno 1728-9, I had fome roots of this plant which were dug up in October, and laid upon the ground in the open air till the beginning of March, when I planted them again, and they fhot out very vigoroufly foon after: nay, even while they lay upon the ground, they ftruck out fibres from the under fide of the roots, and had begun to fhoot green from the crown of the roots. But that wet will deftroy the roots, I am fully convinced; for I fowed a little of the feed upon a moift fpot of ground for a trial, which came up very well, and flourifhed exceedingly during the fummer feafon, but in winter, when the great rains fell, the roots began to rot at bottom, and before the fpring moft of them were deftroyed.

"The beft places to procure the feed from, are Switzerland and the northern parts of France, which fucceeds better with us than that which comes from a more fouthern climate: but this feed may be faved in England in great plenty; in order to which, a fmall quantity of the plants fhould be fuffered to grow uncut till the feeds are ripe, when it muft be cut, and laid to dry in an open barn where the air may freely pafs through: but the feed muft be defended from the wet; for if it be expofed thereto, it will fhoot while it remains in the pod, whereby it will be fpoiled. When it is quite dry, it muft be threfhed out, and cleanfed from the hufk, and preferved in a dry place till the feafon for fowing it: and this feed faved in England is much preferable to any brought from abroad, as I have feveral times experienced; the plants produced from it having been much ftronger than thofe produced from the French, Helvetian, and Turkey feeds, which were fown at the fame time, and on the fame foil and fituation.

"I am inclinable to think that the reafon of this plant's not fucceeding, when it has been fown in England, has either been occafioned by the fowing it with corn, with which it will by no means thrive (for though the plant be very hardy when grown pretty large, yet at its firft coming up, if it be incommoded by any other plant or weeds, it feldom does well; therefore it fhould always be fown by itfelf, and carefully cleared from weeds until it has ftrength, after which it is not eafily deftroyed;) or, perhaps,

haps, people have fown it at a wrong feafon, or in wet weather, whereby the feeds have rotted, and never come up, which hath difcouraged their attempting it again: but however the fuccefs has been, I dare aver, that if the method of fowing or managing this plant, which is here laid down, be duly followed, it will be found to thrive as well as any other fort of fodder now cultivated in England, and will continue much longer: for if the ground be duly ftirred after the cutting of each crop, and the firft crop fed, as hath been directed, the plants will continue in vigour twenty years, or more, without renewing provided they are not permitted to feed, which would weaken the roots more than four times cutting would do.

" The hay of this plant fhould be kept in clofe barns, it being too tender to be kept in ricks open to the air as other hay: but it will remain good, if well dried before it be carried in, three years. The people abroad reckon an acre of this fodder fufficient to keep three horfes all the year round: and I have been affured by perfons of undoubted credit, who have cultivated this plant in England, that three acres of it have fed ten cart-horfes from the end of April to the beginning of October, without any other food, though they have been conftantly worked. Indeed the beft ufe that can be made of this grafs is, to cut it and give it green to the cattle. Where this hath been daily practifed, I have obferved that by the time the field has been cut over, that part which was firft cut, hath been ready to cut again; fo that there has been a conftant fupply in the fame field, from the middle of April to the end of October, when the feafon has continued long mild; and when the fummers have proved fhowery, I have known fix crops cut in one feafon: but in the dry feafons there will be always three. When the plant begins to flower, it fhould then be cut; for if it ftands longer, the ftalks will grow hard, and the under leaves will decay, then the cattle will not fo readily eat it. Where there is a quantity of this cultivated, fome of it fhould be cut before the flowers appear, otherwife there will be too much to cut within a proper time.

" When this is made into hay, it will require a great deal of making: for as the ftalks are very fucculent, it muft be often turned, and expofed a fortnight before it be fit to houfe; for this requires a longer time to make than fainfoin: therefore, when it is cut it fhould be carried to make upon fome grafs-ground; becaufe the earth in the intervals of the rows will wafh up, and mix with the hay in every fhower of rain; and by carrying it off as foon as it is cut, the plants will fhoot out again foon: but it is not fo profitable for hay, as to cut green for all forts of cattle, but efpecially horfes, which are extremely fond of it; and to them it will anfwer the purpofe of both hay and corn, and they may be worked at the fame time juft as much as when they are fed with corn, or dry food." *Miller's Gard. Dict.*

EXPERIMENTS *on Lucern cultivated according to the New Hufbandry, by* M. de Chateauvieux.

" It is truly with regret, fays M. de Chateauvieux, that I am forced to treat a fubject of this importance, in fo fummary a way as the limits of this letter require. However, I hope that even this general account of my experiments may be a guide to thofe who would cultivate this plant. Many perfons who live at a confiderable diftance from this place [Geneva] have already followed my example, and are extremely well fatisfied with their fuccefs.

" Though I agree with M. Duhamel and the other partifans of the New Hufbandry, that lucern and fainfoin thrive beft when cultivated in beds; yet my practice differs, in many refpects, from theirs. This difference confifts in,

1. *The Principle which I apply particularly to the Culture of Lucern.*

" Lucern grows naturally with one large perpendicular, or tap-root, which penetrates very deep into the earth, and has few, if any, lateral roots. From fimilar experiments on other tap-rooted plants, I was induced to think, that this too, by tranfplanting it, and at the fame time cutting off part of its tap-root, might be made to fhoot out feveral horizontal roots, which, reaching into the loofe mould of the alleys, and extending themfelves there, would collect a greater quantity of nourifhment for the plant, and confequently enable it to produce more abundant crops.

" The event has proved, that when we reafon on found principles, we feldom err. My tranfplanted lucern pufhed out numbers of large lateral roots, and thefe branched out again into others, which may be multiplied without end by frequent culture of the alleys: for the horfe-hoe has the fame effect on thefe horizontal roots, as cutting has upon the tap-root.

2. *The Method of tranfplanting the Lucern.*

" I made feveral beds, fome about three feet wide, (including the alleys) into which I tranfplanted a fingle row of lucern; others about three feet nine inches, into which I tranfplanted two rows; and others about four feet three inches wide, in which I put three rows. The defign of this variation was, to fee by which of thefe three methods the fame extent of ground will produce the greateft quantity of lucern. I believe it will require five or fix years to determine exactly which of them will be beft; becaufe, as the plants increafe every year in bulk, their produce alters, and may perhaps not keep in proportion to the firft years, though probably the difference will not be great. But without waiting fo long, I can already fee, that the crop will be greateft by planting only one row on each bed.

" The plants in the fingle rows were fix inches afunder, nor fhould they ever be nearer; and thofe in the double and triple rows, were eight or nine inches diftant from each other. I muft obferve, that I likewife fowed lucern with the drill, in beds, in which it has remained without tranfplanting. It is very fine; but not near fo ftrong and flourifhing as that which I tranfplanted. When lucern is fown where it is to remain, it neceffarily requires being thinned, and that operation takes up more time than tranfplanting it would do."

Rules to be obferved in tranfplanting Lucern into Beds.

" 1. The middle of the beds muft be raifed and arched as high as poffible; and as the lucern is to remain feveral years on the fame ground, no pains fhould be fpared to prepare the earth as well as can be.

" 2. Lucern fhould be fown in the fpring, and in a rich mould, that the plants may be ftrong enough to tranfplant in September.

" 3. Plants two or three years old, may be tranfplanted as well as younger ones.

" 4. They fhould be tranfplanted in September, that they may have time to take frefh root before the winter comes on.

" 5. If they cannot conveniently be tranfplanted in September, it may be done in October, provided the weather be not frofty.

" 6. The mould into which they are tranfplanted fhould be moift; and if the weather be fomewhat rainy, it is fo much the better. In this cafe, I have never found it neceffary to water the plants.

" 7. If lucern is tranfplanted in November or December, there is danger of the frofts forcing many of the plants out of the ground.

" 8. If too warm and dry a feafon prevents tranfplanting in September or October, it is beft to ftay till the winter is paft. The plants will then be fure of taking root, and very few of them will fail.

" 9. If they can be tranfplanted in autumn, they will yield pretty good crops the next year: but if they are not tranfplanted till fpring, the next year's crop will be but indifferent.

" 10. The plants muft be taken up out of the nurfery, with great care and patience, that their roots may not be damaged.

" 11. The roots fhould be left about fix or feven inches long, and the green tops fhould be cut off within about two inches of the crown of the root.

" 12. The

"12. The plants will take root the fooner, if they are put into water as foon as they are taken up, and kept in it till they are planted.

"13. They are planted in holes made with a planting ftick, in the fame manner as cabbages or lettuces are planted in a garden.

"14. The beft way of planting lucern is, to cut a ftrait channel two or three inches deep, and fet the plants in the bottom of it, covering them up to the neck.

"15. Great care fhould be taken not to fuffer any weeds to grow among the lucern; at leaft for the two or three firft years. To this end, the rows fhould be weeded by hand, as well as the edge of the alleys near the plants, where the horfe-hoe cannot go.

"16. The alleys may be ftirred, either with the fingle cultivator, or the cultivator with two mould-boards; which, at the fame time that it deftroys the weeds, keeps the mould loofe.

"17. The firft ftirring may be given with the fingle cultivator, with which a furrow may be cut on each fide of the main furrow in the middle of the alleys, by which means the earth will be turned over on both fides of it.

"18. The fecond ftirring may be given with the cultivator with two mould-boards, by drawing it along the middle of the alleys. This will turn the earth towards the rows. By thefe alternate ftirrings, the alley will be conftantly kept in a loofe ftate.

"19. This culture is fo eafily performed, and in fo fhort a time, that it may be repeated frequently. In this I differ from M. Duhamel, who orders it but feldom. My opinion is, that the alley fhould be ftirred once a month, during the whole time that the lucern is in a growing ftate.

"20. If the alleys keep free from weeds, lefs ftirring them may do: but the mould fhould never be fuffered to grow too hard.

"21. As foon as fome of the plants begin to bloffom, the lucern fhould be cut. It will then make excellent fodder, fuperior to every other kind.

"22. The lucern hay fhould be dried as quick as poffible, and frequently turned. The lefs it is expofed to the heat of the fun, the better fodder it makes.

"23. Lucern muft not be houfed till it is dry: but at the fame time care muft be taken that it be not too dry: for then many of the leaves will fall off, as they dry fooner than the ftalks.

"24. Cattle muft not have too much lucern given them at a time, till they are accuftomed to it.

"25. No cattle fhould ever be fuffered to feed on the beds of lucern. If the earth is very dry, towards the latter end of autumn, fheep will do it the leaft hurt. If the plants are then tall enough to be mowed, the beft way is to cut them, and give them green to the cattle.

"Thefe rules contain all that is effentially neceffary for making and keeping in good order this kind of artificial pafture. I can fafely fay, that whoever tries them, will be abundantly rewarded for his trouble and expence. Sainfoin may be cultivated in the fame manner."

Account of the Produce of Lucern planted in Beds, and cultivated according to the Principles of the New Hufbandry: with fome important Reflections on the Advantages which may be obtained therefrom: by M. de Chateauvieux.

"No judgment fhould be formed of what lucern may produce, by the crops of the firft or fecond year: it is then too young to be able to yield much. If we were to calculate even by its third year's produce, we fhould ftill confider, that as the plants increafe every year in bulk and vigour (and where they will ftop I am not yet able to determine) the produce will be proportioned to that increafe, and confequently the crop of each fucceeding year will be greater than that of the former.

"The crops I am going to fpeak of, are thofe of the fecond and third year: but my calculations will be made on that of the third year. It is proper to remember, that the years 1753 and 1754 were uncommonly dry, infomuch that, fometimes, not a drop of rain, nor fcarce any dew, fell between the cutting of one crop and that of another. The feafons were fo unfavourable to the production of grafs, that hay rofe to an exceffive price.

"I fhall firft fay what was the ftate of the plants of lucern in their third year, and afterwards how much hay they yielded.

State of the Plants in their third Year.

"As the part of the plant which I now confider is that which is buried in the earth, I uncovered numbers of them, that I might be able to judge of their general ftate. I was greatly ftruck with the effect which tranfplanting had had upon them. Inftead of one perpendicular root, which they ufually have, all thefe plants had three, four, five, and fometimes more, almoft equally big roots. They were, in general, three quarters of an inch in diameter, and proceeded from the original root, which was now at leaft an inch in diameter, and in many of the plants an inch and a half. After the moft careful fearch that I could poffibly make, I could not find one plant of lucern fown in the common way, though it had ftood twelve, twenty, or more, years, whofe tap-root had grown to the bignefs of an inch diameter: few of them were above half, or at moft three quarters of an inch thick. This difference is very great.

"I likewife found, that the roots of the tranfplanted lucern had produced another kind of roots, of which I faw none about thofe of the old lucern. Thefe were a great number of fibrous roots, fome of which were already one twelfth of an inch in diameter, and looked as if they would alfo become principal roots.

"The ftalks feem to rife out of the earth; and from the firft time of cutting them, a kind of head forms juft above ground, which extends itfelf every year. The firft year, this head was two or three inches wide: the fecond year, it was generally about fix inches over, and this third year, almoft half the plants have a crown ten or twelve inches in diameter: and as many of them have grown fo as to touch one another, their crowns are become of an oval form, having extended themfelves on the fides where they met with no refiftance.

CROPS.

"I have a field of lucern in beds, divided into two parts. This is the third crop of lucern off one of them. The beds are 250 feet long. In 1753, I cut this lucern fix times, viz. in May, June, July, Auguft, September, and the beginning of November. This laft cutting was not near fo plentiful as the others, and I dried it within doors.

"Thefe cuttings off one bed, on which there was but one row of lucern, yielded 140 pounds of well dried hay.

"In 1754, the lucern was late before it began to fhoot, and the earth was drier than the year before. I had but five crops: the firft was cut on the 27th of May; the fecond on the firft of July; the third on the 27th of July; the fourth on the 26th of Auguft; and the fifth on the 23d of October. Thefe five cuttings yielded in all 225 pounds of well dried hay off each bed.

"A field 250 feet long, which was the length of my beds, and 210 feet wide, contains an arpent of our meafure. This arpent, divided into fixty-eight beds, each three feet wide, producing after the rate of 225 pounds of hay off each bed, would yield in all 15300 pounds; which is infinitely more than is ever obtained in the common way.

"The beds with three rows yielded much lefs. The third year, their crops amounted to no more than 169 pounds off each bed, which is a fourth lefs than the others: and as thefe beds are wider, inftead of having fixty-eight, as in the former difpofition of the arpent, there will be only forty-feven, each four feet three inches wide, the total produce of which will be but 7943 pounds: confequently this arpent will yield little more than half as much as an arpent laid out in beds three feet wide, planted with only fingle rows.

Remarks, by M. de Chateauvieux.

"The plants of lucern had the fate of all kinds of plantations; that is to fay, fome of them were more vigorous

gorous than others. The greatest number of the plants produced each of them a pound of dry hay, and some of them yielded two pounds. I look upon these last as such extraordinary productions, that I do not expect many of them to yield the like quantity again. I think one may be very well satisfied, if the plants, one with another, yield a pound of hay apiece every year. This is nearly the result of my experiment on beds which had but one row; and the produce of these would have been still greater, if many of my plants had not failed: in the room of which I set young ones, which could not acquire sufficient strength to yield full crops.

" In these experiments, I have employed no dung: neither have I for any of my corn fields. I have reserved it for improving my pastures and meadows; and intend next to apply it to my lucern, which, I doubt not, but will be much the finer for it. The only thing now remaining is, to know by experience which will be the best way of using it. I have some thoughts on that head, which may render it much more profitable.

Lucern deserves to be cultivated with care: not only on account of the great quantity of fodder which it yields, but likewise because the quality of its hay is superior to any other. The New Husbandry will render it still more perfect. Plants cultivated this way enjoy the benefit of a free circulation of the air, and that circulation keeps them sweet and sound, and free from all mustiness towards their roots: for, being open to the rays of the sun, that great source of kindly vegetation, they attain great perfection in all their parts, both as to their substance, and their flavour. Cattle eat this food greedily, and are better nourished with it, than with any other: but as every excess is bad, too great a quantity should not be given them at once, especially at first, lest it should swell them. The best way is, to bring them to it by degrees.

" I have experienced these qualities in this hay, by comparing it with every other sort. The excellence of this, justifies the principles on which the New Husbandry is founded. I have offered to my horses bundles of every kind of hay, and at the same time a bundle of this hay of lucern. They have not hesitated a moment to prefer the latter. Nothing but its superior qualities could determine them in this choice, which never varied, and has always been in favour of the lucern cultivated in this manner.

" It would be lavishing this excellent fodder, to feed horses entirely with it. It need only be given them by turns with common hay: which will be a great saving: for this lucern will supply the place of oats. I am certain that my horses fed partly with this hay, and without oats, will be in better plight, stronger, and more vigorous, than those which are fed with meadow hay and corn in the usual way. It is now some time since I have fed my coach-horses with it, and have retrenched their oats. Instead of this last food, and at the hours they used to have it, I give them lucern chopt, as the Spaniards do straw to their horses. Mine are as fond of it, and shew the same impatience to find it in their manger, as if it was oats; and since their being put under this diet, they are in better condition than before, and so mettlesome, that the coachman has enough to do to keep them in.

" When I said that retrenching the oats would be a considerable saving, I did not so much mean the saving of the expence of that corn, as the better improving of many vast tracts of land which are sown with oats, and might, with proper management, produce much more useful and more profitable sorts of grain, notwithstanding the too general prejudice, that some lands are not capable of bearing any better. For my part, I am thoroughly satisfied, that whatever ground can bear a crop of oats, can likewise, under the New Husbandry, bear any other grain."

Continuation of M. de Chateauvieux's *Account of his Experiments on Lucern, in the Years* 1755, *and* 1756.

" The great drought of the year 1755, was accompanied with great heat; and the year 1756 was very rainy, and moderately warm, there being but few very hot days in it.

" My lucern was exposed to a most severe winter in 1755, when the frost was excessive hard, and lasted very long. M. de Reaumur's thermometer was some days, at different times, eight, nine, ten, twelve, and thirteen degrees below the freezing point; and on the third of February, a thermometer, in the open air, stood at sixteen degrees below freezing. These severe frosts made me uneasy for my lucern, which, however, bore them, without receiving any damage.

" The rains in 1756 did no hurt to these plants, but they prevented my cutting them at proper times. I had but four crops of lucern this year, being obliged to wait for an appearance of fine weather to dry it in, before I could venture to cut it down. These rains likewise hindered my giving the proper hoeings to the alleys, which were full of weeds during the summer and autumn. I chose rather to leave them in that condition, than attempt to hoe them while the ground was over wet: not doubting but the spring hoeings would easily destroy them.

" In 1755, I cut my lucern five times: the first was, on the third of May, before any flowers appeared: the second, on the twelfth of June: the third, on the fifteenth of July: the fourth, on the twenty-first of August: and the fifth, on the seventh of October. I was obliged to finish the drying of this last cutting, in barns and under cover.

" In 1756, which was the fifth year of these plants, I cut them but four times: the first, on the third of June: the second, on the first of July: the third, on the fourth of August: and the fourth, on the twenty-seventh of September.

A bed 250 feet long, with only one row of lucern,

Yielded	In 1754 - - - - -	225	pounds of dry hay.
	1755 - - - - -	197	
	1756 - - - - -	281	

In three years, 703 pounds.

A bed of the same length, with three rows of lucern,

Yielded	In 1754 - - - - -	169	pounds of dry hay.
	1755 - - - - -	180	
	1756 - - - - -	226	

In three years, 575 pounds.

Observations by M. de Chateauvieux.

" We see, by the above account of three years, that a piece of ground laid out in narrow beds, planted with only one row of lucern, yielded a greater produce than the same extent made into wider beds, and planted with three rows.

" I shall not, however, pretend to determine from this one experiment, that it is best to lay down large fields in this manner. I think it will be right to try first, whether the success will be the same on different soils, and likewise on lands whose exposition may be more or less advantageous. If after repeated trials, the beds which have but one row of plants, yield the greatest quantity of hay, that method is certainly to be preferred. To clear up this point still more to my satisfaction, I continue to plant lucern in beds, some with one, and others with three rows.

" The difference between the crop of 1756, and those of the two preceding years, would induce one to think that rainy seasons are best for the production of hay: but still, the greater quantity which the year 1756 produced, must not be imputed to the rain only: we should likewise consider, that the plants had throve greatly since 1754; that their stems were grown much larger, and their roots much stronger and more numerous, and that they were consequently able to yield much greater crops than before. They have abundantly answered my expectation, both as to quantity and quality.

" With respect to the quantity, it is much greater than that of any common fodder: I mean, of any that the same extent of ground would have produced, if cultivated in the common way, though it would then have been covered with an immense quantity of plants. This is a fact, which numbers of experiments prove, and which we shall cease to wonder at when we consider the great effects of the frequent stirring of the alleys. To this it is that I owe the repetition of my crops, and their being all of nearly equal goodness. I do not exaggerate when I say, that every summer month, which is the time I generally allow between each cutting, will produce shoots two feet long, and sometimes more: and supposing that I cut them but five times a year, each plant will have produced after the rate of nine or ten feet length of shoots, and that in the same time that most meadows will not produce grass above two feet long.

"As to the quality of this hay, I continue to prefer it to all other fodder. My experience has confirmed what I said of it in 1754; and I shall only add, that I have since found, that it is as good at the end of four years, as when it is first cut. If there was any difference, horses would soon be sensible of it: but they eat of either without distinction.

"I feed my horses with it, chiefly in the summer, at which time they do most work, and am more and more sensible of the advantages of it. Five or six pounds of lucern a day, are sufficient for a middle sized horse: but the quantity may be increased or diminished, according as the horse is nourished by it; for in that there is great difference." *Culture des Terres, tom.* IV. *c.* iii. *art.* 15.

The following account of the cultivation of lucern, was communicated to the public by a very ingenious husbandman, and merits the attention of the reader.

Having read and heard a great deal of lucern, I determined to have some of it myself; and Mr. Miller's method seeming to me by far the most rational, I resolved to follow it: accordingly, the seventeenth of July, 1763, I ordered a field of three acres and a half, then under rye-grass and clover, to be ploughed deep, and sown with turnips. The crop was middling: I sold them to a cow-farmer for nine guineas: he drew and carted them home. If I had had sheep, I would have fed them on the field.

By the twenty-seventh of March, 1764, the field had been twice ploughed, the first time ten, and the last time near twelve inches deep, with the Rotheran-plough and four horses a-breast: the soil is light and stoney, with a rock of gravel about ten or twelve inches deep, and had never before been ploughed above six or seven inches deep; however, I knew it was right to go as deep as I could for a tap-rooted plant, as the lucern is.

I was greatly pleased with reading M. Lullin de Chateauvieux's account of his method of transplanting lucern, and determined to follow it, from a full conviction that it must be superior to every other method.

Accordingly I ordered the field to be sown with Poland oats, and laid out about twenty-eight rods in beds four feet wide, alleys one foot and a half, which were sown with lucern in broad-cast by my gardener, in the same manner as you sow cabbages or savoys in seed-beds: one bed, however, out of curiosity, I ordered him to sow in the following manner.

Run a garden-line through the middle of the bed from one end to the other; draw a small drill along the line, about half an inch deep; then move the line six inches, and make another drill, and so on: by this means you will have nine drills on a bed four feet wide. When this is done, fill a quart or pint bottle near full with your lucern-seed, cork the bottle, bore a hole in the cork, and insert a quill cut at each end: this will be found a great assistance in sowing the seed thin and regularly in the drills: and I must observe, that the bed which I sowed in this manner, afforded me much the greatest quantity of plants, and by far the finest. Another advantage attending it is, that it is kept clean with much more ease, and far less expence; for a gardener, with the small three-inch hand-hoe, will clean a great deal of ground in a small space of time. When the bed is sown, the seed must be covered with care: rather chuse the backside of a small rake than the teeth.

By the middle of August, my plants looked very well, and were mostly in bloom, when I ordered them to be mown, and given to my horses and cows, who seemed as if they had a high treat.

The oats being got in, I ordered the field to be deep ploughed again, and then waited for a season of rain to begin my planting, which, by my journal, did not come till the fifteenth and sixteenth of September; and the field being first well harrowed, we went to work the seventeenth, and continued planting till the twenty-ninth; nor can I now see any difference between those planted the seventeenth or twenty-ninth. Though I quite agree with the author of the Essays, that it is best to plant sooner than I did if possible; yet I must observe, that what may do for gardens, or small pieces of ground, will not do for fields. From the last week of August to the middle of September, seems to me a very proper time. But "filling each hole with water, making drills, half filling them with sea-sand or wood ashes, and watering each plant," as the author of the Essays mentions, is an endless and very expensive work.

For my part, I kept my eye on M. Chateauvieux's directions, as laid down above, with regard to that part that relates to planting; but another ingenious gentleman, having cautioned the public against planting on ridges, I must needs say, I was fearful of the rain and frost myself, if planted in that manner, especially on light land; and therefore I ordered my field to be ploughed as level as possible, and made my man, after the field was ploughed, go three bouts on each side the furrows, so that, when harrowed across, you could hardly tell where they were. The field being brought to this order, as I said before, we began to plant the 17th of September: two men with spades dug up the plants, and two women cut them: some care is certainly required in taking them up, but I did not find it great; it was done by common labourers. The women were ordered to cut the plants to about six or seven inches long in the root, and the tops to about two inches, as M. Chateauvieux directs. They did it very handily: their method was to take them up one by one, (so that they could throw by the faulty ones) and when they had about a dozen in their hands, they cut them at top and bottom with one stroke of the knife at each end. Each had a washing-tub by her side, filled to about six inches with water: as they cut the plants, they set them in the tubs; and as they filled one tub, another was brought them.

The method of planting is the same as for cabbages: men who are used to work in gardens will do it very handily with a dibble or planting stick; but that mine might stand with all possible exactness, each man had a garden-line and reel: and as I think I shall be very able to keep them clean with M. Lullin's single cultivator, the rows are only twenty inches apart, and six inches in the lines.

If I find a difficulty in keeping them clean in this method, then by drawing every other row, which may be done with great ease, my plants will stand at the distance directed by M. Chateauvieux, of three feet four inches.

I was very impatient to see the effect transplanting would have, and therefore, as soon as my plants in the seed-bed were about six inches high, I drew several, cut and transplanted them, and in the autumn I took up these plants, and found they had all formed new-tap roots round the bottom of the piece (if I may so call it) planted, and instead of one, they had from five to thirteen new roots: this, you may suppose, gave me great pleasure, and convinced me, that the illustrious Swiss was quite right.

The author of the Essays on Husbandry, I find, cut his plants with scissars: this must be very tedious work; and, with submission, I think he is quite wrong in cutting his plants to the length of nine or ten inches. Six or seven inches seem to me a much properer length; for the ground being dug or ploughed about twelve inches, the new roots will have five or six inches of well-loosened mould to strike into, which must be a great advantage to the plants; and if gravel, or a strong clay, is near the surface, I am convinced mine, or rather M. Lullin's, is the best method.

Yet this gentleman says, he cut his tap-roots too short, and knew not how to manage a root that was very small: in regard to the last, I must observe, that, if they were very small, I ordered them to be thrown away. So much has been said on the necessity of keeping lucern in broad-cast, drills, or transplanted, free from weeds, that I will say nothing on that subject.

At the same time that this gentleman so warmly recommends M. Chateauvieux's method of cultivating lucern by transplanting, he has, I fear, thrown a stumbling-block

in

in the way of moſt gentlemen, and, I think, every farmer; I mean his calculation of the expence: this, therefore, I muſt endeavour to remove.

When I began to cultivate lucern in this manner, the only defect I could find in M. Chateauvieux's account was, that he had not told the public how much ground they were to ſet apart for a nurſery: this deficiency, however, I can ſupply to thoſe who come after me, for ſixteen rod will be about the quantity for an acre; and then, I think, the expence of tranſplanting will ſtand as follows:

	l.	s.	d.
Digging, ſpit-deep, ſixteen rods, at three-pence per rod - - - -	0	4	0
Seed, three pounds, at one ſhilling per pound	0	3	0
Weeding the nurſery twice with the three-inch hand-hoe. (By ſowing in this manner, tranſplanting will not be wanted; nor do I think it proper, as they are to be tranſplanted again) - - -	0	3	0
Ploughing - - - - -	0	10	0
Tranſplanting - - - -	1	5	0
Hand-hoeing the plantation once, the middle or latter end of October, in dry weather, which men uſed to hoeing turnips will do for three or four, but ſay - -	0	5	0
	2	10	0

This, I am perſuaded, is the full expence of making the plantation; yet the author of the Eſſays has ſtrangly worked it up to ſix pounds twelve ſhillings per acre: however, I readily ſubmit this account to the inſpection of every farmer and every gentleman in the kingdom, converſant in matters of this kind.

If the ſpring-ploughing for barley or oats has been nine or ten inches deep, then a ploughing in autumn of twelve inches will be ſufficient, and cannot be charged at more than ten ſhillings. The trenching for the ſeed-beds may be done at leiſure time; ſo may the weeding of the nurſery, and the hand-hoeing of the plantation: then the real expence to the farmer will be only the ſeed and tranſplanting, or one pound eight ſhillings per acre.

As to what this gentleman calls the yearly charges, I can by no means agree to them; for the plantation having been weeded in October, will lie very ſafe and well till the latter end of February, or beginning of March: then, in dry weather, it may be hand-hoed again, the expence of which has before been charged at five ſhillings per acre; to which add four horſe-hoeings after each cutting, at eleven ſhillings, which makes ſixteen ſhillings per acre the annual charge.

I cannot recollect any thing further that is neceſſary to be ſaid on the ſubject of tranſplanted lucern; but as I would have every one, who writes to you on ſubjects of this ſort, tell the truth, the whole truth, and nothing but the truth; ſo I think it but juſt to ſay a word or two on lucern ſown in broad-caſt, or Mr. Rocque's manner. I live within a few miles of Mr. Rocque; and muſt add, that I have paid great attention to the culture and growth of lucern and burnet for ſome years paſt; ſo that I think I am pretty well acquainted with them.

The author of the Eſſays ſays, "If lucern is ſown broad-caſt with corn, no care can keep it clean: it may laſt two years, only one crop being tolerable, and then muſt periſh in the common courſe of nature." And ſeveral of your correſpondents are alſo of opinion it will never ſucceed in this method; but I know it will; for I have ſeen it cut three and four times. To cut it four times, the ſummer muſt be very favourable, and the laſt cutting will be late. Here I muſt remark, that lucern is not only excellent as a green fodder, but as an early one, eſpecially if ſown in drills, or tranſplanted; for that ſown in broad-caſt will not be fit for cutting ſo ſoon as the former, by a fortnight or more; however, the farmer may depend on three good crops in this manner of ſowing.

In the ſpring, 1760, Mr. Rocque ſowed about five acres with lucern and barley: the land is light and hot, but being in good heart, the barley was rank, which obliged him to mow it green, and ſell it to a farmer for feeding cows, &c. Indeed I believe it will always be beſt to do ſo; for the weeds, if there are any, are thus cut down, and the lucern thrives apace. The ſpring following, it may be harrowed with light harrows, and every year after with ſuch harrows as you find clean it beſt. Laſt autumn, when the weather was hot and dry, I ſaw a farmer harrowing Rocque's field with large ox-harrows, and I do not perceive that it is at all hurt. The weeds and trumpery were raked up, and carted to a dung-hill, with which he has this ſpring dreſſed his field, and it is now in a fine thriving condition.

Lucern makes moſt excellent hay: horſes are very fond of it, and, with one quartern of oats, I will be bound any gentleman will be well ſatisfied with the condition of his horſes, even coach-horſes; nor do I ſee it is at all more difficult to be made into hay than clover. *Muſæum Ruſticum, vol.* IV. *page* 307.

Experiments on Lucern, by Mr. John Wynne Baker, publiſhed by the Dublin Society.

The ineſtimable value of this plant has been ſo much ſpoken of by all the ableſt writers on huſbandry, that it is quite unneceſſary for me to ſay any thing in its recommendation.

Here follow my experiments upon it this year.

No.
15. Sown in drills, three feet aſunder.
16. Sown in drills, two feet aſunder.
17. Sown in drills, one foot aſunder.
18. Sown in the common, or broad-caſt way.

I ſowed the ſeed for theſe experiments on the firſt of May, but the middle of April would have been a more proper ſeaſon.

The lucern began to appear on the eighth day: in its firſt appearance, it has two very ſmall leaves of an oval form.

Theſe experiments were treated in the ſame manner as the burnet.

On the ſixteenth of Auguſt, I cut the lucern of each experiment, and the produce of green fodder was as follows:

Number 15. i. e. the three feet drills, produced off one perch, thirty-one pounds and a quarter.
Number 16. i. e. the two-feet drills, produced off one perch, forty-four pounds and a half.
Number 17. i. e. the one-foot drills, produced off one perch, forty-three pounds.
Number 18. i. e. the broad-caſt, produced off one perch, fifty-nine pounds.

Upon the face of theſe experiments, the broad-caſt has the greateſt produce. Above the three-feet drills, twenty-ſeven pounds and three quarters; above the two-feet drills, fourteen pounds and a half; and above the one-foot drills, ſixteen pounds.

Hence it may be concluded, by perſons not acquainted with the nature and culture of this plant, that the broad-caſt ſowing is to be preferred, as yielding the greater produce; but I think that concluſion ſhould not be too haſtily drawn, for the following reaſons.

Theſe crops are all from the firſt cutting after ſowing the ſeed, and therefore the lucern in the broad-caſt was then as good, or probably better, than it will ever be again in any ſucceeding crop, the ground being looſer, and fewer weeds in it, than there ever can be hereafter; for the natural graſs is already riſing in it, although it was managed in the way practiſed by Mr. Rocque; which is to harrow, or rake the ground after cutting the lucern. Another reaſon is, that for the firſt year the plants are in their infancy; but in three years I apprehend the drills will more than treble their produce: whereas, at that time, I ſhould fear the broad-caſt would be quite or near deſtroyed by the natural graſs. In other words, as faſt as the drilled crops improve, I do conceive the broad-caſt will diminiſh.

The culture of lucern in drills, with intervals of only one foot, I find is no better than the broad-caſt, as there is no ſuch thing as horſe-hoeing between the rows, and where the crop ſhould be large, digging would be too expenſive.

But

But upon the comparative experiment, between the two and three feet intervals, I confefs I cannot fo readily pronounce: the two feet produce the moft, by thirteen pounds and a quarter; whether that diftance will continue to do fo, I cannot fay: it may happen that when the roots become large, which is the propereft time to afcertain the fact, that the three-feet drills may have the greater produce; but time alone can determine this point, which really is very material to know.

Second Set of Experiments on Lucern.

Thefe experiments were calculated to difcover how far the roots of this plant would bear being wounded, as in the culture of lucern practifed by Mr. Rocque: I do conceive many of the roots muft be injured, to the manifeft diminution of the crop.

In April, 1763, I fowed a little lucern in my garden. May the firft, 1764, I treated fome of the plants in the following manner, after thinning of them in the row, by taking all others from them, and leaving the plants fingle, and about two feet afunder.

Numb. 1. The root of this plant I fplit from the crown of it downwards, for about an inch.

Numb. 2. The root of this plant was fplit firft in the fame direction as the former, and then I fplit it tranfverfely, for about an inch downwards.

Numb. 3. The root of this plant I cut a flice off one fide, about an inch long, juft below the crown of the root.

Numb. 4. This plant I cut the whole crown of the root off.

Numb. 5. This plant I fplit the root of, in the fame manner as Numb. 1. and then cut about an inch and a half off one fide.

After wounding thefe plants, I dug the earth round them, in order to feed the fibrous roots to the nourifhment of the plants.

They never afterwards made any figure. Towards September, Numb. 1, 2, and 3, threw out a few weak ftems, not worth notice; but Numb. 4, and 5, never grew afterwards.

Thefe experiments I mean to repeat in a greater number, and that for two or three years together, before I fhall venture to draw pofitive conclufions from them: but I think thefe feem to prove, that Mr. Rocque's method is not to be preferred fo much beyond Tull's, Duhamel's, and M. de Chateauvieux's, as his advocates would infinuate. But the fair trial between his method and the drill, will be to experiment carefully upon them for four or five years together; my experiments in wounding the plants, being only calculated to fupport theory by facts; for my notion of the confequences which muft happen from his culture, is no more than theory.

Till I made this fet of experiments, I confefs I never was fenfible of the texture and firmnefs of lucern-roots, which are really very hard to cut, and not much unlike a dried ftick, which I muft confefs feems to favour Mr. Rocque's method, fo far as relates to my apprehenfion of the plants being wounded by his inftruments, which, from the hardnefs of the roots, cannot wound them in the manner I did mine with a knife. And as my purfuits tend only to difcover the truth in matters of hufbandry, for Mr. Rocque's honour, and my own credit, I could not omit to communicate this remark, as I hope the reader will believe I am endeavouring to afcertain the beft culture for lucern, and not writing to leffen Mr. Rocque or his fyftem: every man acting in a private capacity, has a right to adopt fuch as he pleafes; but I, who am acting in a great meafure for the public, think myfelf bound to be confcientioufly exact in my fcrutiny of every fyftem, which I fhall comparatively experiment upon. If I am miftaken in the culture of lucern, I have the fatisfaction of confidering fome of the greateft men, who have ever wrote upon the fubject, are no lefs miftaken than I am.

Notwithftanding all that has been faid by many writers on lucern, as to its tap-roots, yet I find it has many lateral ones, and it is only a few of the plants that fend down but one tap-root, but an infinite number in all fhapes and directions. At a year old, I find the healthy ones are from ten to eighteen inches long; I preferve them of that age now by me, and intend every year to take them up, in order to have them of all ages, the better to fee their progrefs from year to year.

Upon the firft of laft May, fome of my lucern, which was fown the year before, was eighteen inches high; but let it be obferved, that it had the benefit of a fouth afpect, aided by the reflection of a fruit-wall. This induces me to believe, that a declivity with a fouth afpect, will be the moft advantageous fituation for this plant, in this country; for, although lucern will live in the fevereft winters, yet it flourifhes beft under the influence of a warm fun; the only bleffing we feem to want in this country.

In the fummer months I obferve, in a good foil, and under proper culture, it grows about an inch in twenty-four hours; fometimes I have known it grow an inch and a half in the fame time.

Third Set of Experiments on Lucern.

The tranfplanting lucern feems to have been firft thought of by the ingenious and never-fufficiently to be praifed M. de Chateauvieux, whofe reafons for every new attempt are founded upon fuch folid and rational principles, that they have generally fucceeded to his expectations. This gentleman fays, plants of two or three years old may be planted equally well with thofe of one year old.

My plants laft April were all one year old, which, upon taking up for the purpofe of tranfplanting, I found differed very much in their fize, which induced me to divide them into three parcels, *i.e.* the fmalleft, middling, and largeft. Thefe I tranfplanted in the following manner, fix inches afunder in the rows, and the rows three feet.

Numb. 1. Forty of the fmalleft plants, with their tap or leading roots cut off.

Numb. 2. Forty of the middling plants, with their tap or leading roots cut off.

Numb. 3. Forty of the largeft plants, with their tap or leading roots cut off.

Numb. 4. Forty of the middling plants, without cutting their roots.

Numb. 5. Forty of the largeft plants, without cutting their roots.

Numb. 6. Forty of the fmalleft plants, without cutting their roots.

Thefe fix rows of plants were put down the twenty-eighth day of April. I watered them at the time of putting down, and once afterwards.

Very few of them died; fo that the different fizes and methods feem to anfwer equally well the firft feafon.

I intended to have cut the produce of each experiment for weighing; but a few days before that was to be done my horfes got into the place where it grew, and eat fome of it, which difappointed my purpofe. From the appearance of the experiments refpectively, there would have been very little, if any difference in the produce; but a third and fourth year's crops will afcertain how far cutting off the tap-roots will benefit the plants, and how far tranfplanting is preferable to fowing. Be it noted, that the tranfplanted roots make no great figure the firft year.

In order to afcertain, with fome degree of certainty, how far lucern may be worth the farmer's attention, I laft fummer made an experiment with an horfe, to difcover how much he would eat, which being known, we can, from the firft fet of experiments, pretty exactly tell how many horfes an acre of lucern will maintain during the fummer months. The horfe I chofe for this purpofe is a very large one; he had been ploughing from feven o'clock in the morning till feven in the evening, during which time I forbid his having any thing to eat. When he was taken out of the plow, I ordered him into a ftable by himfelf, where I had provided for him fifty-fix pounds of lucern, without any other food for that night, of which he had eat by next morning, forty-nine pounds; a quantity, which I own furprized me.

Lucern will in this country, in favourable feafons, mow four times in a fummer after the firft year, and we may

may safely calculate, that at every cutting it will yield half an hundred weight upon each perch, which at the four cuttings is two hundred weight upon a perch in the season, or sixteen tons upon an acre, *i. e.* thirty-five thousand eight hundred and forty pounds. This is a low calculation; but at this rate, suppose five horses to be allowed forty-nine pounds every twenty-four hours, which is two hundred and forty-five pounds, in that case an acre will maintain them one hundred and forty-six days, which is twenty weeks and six days. No man will contend for it, I believe, that any natural pasture will do any such thing. Add to this profit, the circumstance of making dung all the summer; an object, I am sorry to observe, not sufficiently attended to in this country, amongst the common farmers; if they can make a little for their potatoes, they seem to think of no more.

Lucern should never be sown upon wet or spungy ground, but upon dry rich land, and must always be kept free from weeds.

I sowed some last April in drills, upon ground not six inches deep, above a lime-stone quarry, and it grew very luxuriantly; but the soil is very good.

Turneps are the best preparation of ground that I know of for lucern, particularly if they be raised in drills, in the manner before represented.

My lucern in the broad-cast and one-foot drills, was infected with the rust or mildew, during its growth; this seems to be an objection to the sowing of it with such narrow intervals, or in the broad-cast way, since the two-feet and three-feet drills were in the same place, and they were not at all infected with this disease.

An Account of the comparative Advantages of cultivating Lucern, on the Drill and Broad-cast Methods; for which the Society for the Encouragement of Arts, &c. adjudged their Premium of a Gold Medal.

The farm on which the following experiments were made, is a strong clay; a soil, in the opinion of all writers in agriculture, the most unfriendly to lucern. Encouraged, however, by M. Lullin de Chateauxvieux's experiments, the owner was tempted to try how the lucern would succeed when treated in the manner he proposes: and in the year 1761, he sowed a field of about three acres with lucern in drills, two feet asunder. During the first year, he caused it to be weeded carefully; and from the places where it grew too thick, he supplied those in which it had failed. After every weeding, he caused the intervals to be stirred with a horse-hoe, resembling M. Lullin's single cultivator, which manifestly revived the plants.

In 1762, the plants throve greatly, being kept clean, and horse-hoe'd as in the former year; and the society having published a premium for a comparative trial between lucern sown in broad-cast, and in drills, he determined to try one part of that experiment on this field, and not to bestow on his lucern any manure whatever, or to give it any other help than the horse-hoe.

In 1763, the plants were arrived at a size to yield so full a crop as to maintain five horses, from the middle of May to the end of autumn, or above five months. These horses, though constantly worked very hard, had neither corn or hay given them during all this time; and yet they continued in strength and spirit, and grew fat. A horse which in May was so weak, and in so bad a state of health, that it was thought he could not live, soon recovered, when fed with lucern. The plants were in general between three feet and three feet and a half high, at the first and second cutting. The plants made so many shoots, and these shoots branched so much, that in three weeks after every cutting, or sometimes sooner, the intervals quite disappeared; the whole field being so equally covered, that it looked as if sown in broad-cast. December 1763, January and February 1764, having been uncommonly rainy, the water stood in some parts of the field; and though there was generally such a declivity as that it might have been carried off, he resolved to let it remain, in order to see what effect it would have on the lucern. When the lucern began to rise in the rest of the field, in spring, he found that wherever the water had stood, the plants were killed. He supplied this loss by transplanting lucern from other parts; and these plants throve very well. By a continuance of the same treatment, the lucern remained in a very flourishing state: and retained a beautiful verdure and vigour, during the very great drought of this summer, 1765. It has yielded four cuttings every year, and sometimes five.

Having observed in a root of lucern taken up in the winter, that the spring shoots had no connection or concern with the remains of the shoots of the preceding summers, but proceeded from numbers of little tubercles, with which the head of the root was set very thick; it appeared evident, that the plants could not sustain any damage, though covered with a depth of earth during the winter. This suggested a hint, that the intervals might be plowed as deep as possible early in the winter, turning the earth on the beds; and that by letting the earth remain in this condition till spring, the clay, or strong soil in which the lucern grew, would be mellowed, or loosened, by the winter's frost and rain: and being harrowed smooth in February, the fresh lateral roots, which shoot out in the spring, would find a fine fresh mould to extend themselves in, which must tend greatly to the benefit of the plants. This thought was confirmed by experiment: for the spring crop is amazingly vigorous ever since this practice was followed, and the shoots though of great length, and most plentifully supplied with branches, are so strong, that no rain or wind lays them, even when they have stood to be in full bloom, as is the case with part of the first crop; the horses not being able to consume the lucern before part of it is necessarily in bloom. Another advantage arising from this practice is, that the grass which takes root near the plants, and which cannot be otherwise destroyed but by hand-hoeing, is killed by being so long covered with the earth laid on the beds.

In 1761, a spot of ground of an exactly similar soil was inclosed for a kitchen-garden; and there being part of it, which was not wanted for other use, in the spring of 1762, it was sown with lucern in broad-cast, as a counter experiment to the former. The warmth of the garden, and the partiality of the gardener to this method, who held the field experiments very cheap, gave his lucern every advantage that could be desired. It came up well, and was kept free from weeds; but it neither grew so fast nor so high as the lucern sown in drills. This difference became much more sensible during the second and third years; for in 1764 the field lucern had got the start of it so far, that this did not rise to half the height, nor did it yield a quarter of the quantity of fodder; so that he thought it needless to prosecute the comparison further.

Seeing so very remarkable a difference between the lucern raised in drills, and that raised in broad-cast, he resolved to try what share of this advantage might be placed to the horse-hoe, and what to the distance at which the plants stood; which distance afforded the roots more room to extend in. With this view, in 1764, he sowed a neighbouring field in rows, two feet asunder, intending to horse-hoe one half, and to keep the other free from weeds by hand-hoeing only. The months of April, May, and June, of that year, were so dry that the plants came up thin; and the clay was become so hard, that the horse-hoe could not be made use of till late in the year. Even with this disadvantage there was seen a manifest difference, in favour of the plants that were horse-hoed. The same difference was also observable in the spring of this year: but the uninterrupted drought of this summer has kept the clay so hard that the horse-hoe could not be used.

Computing the rent of the land, and the utmost expence that can attend the horse-hoeings and cuttings, it will be found, that feeding horses with lucern will be a great saving, when compared with the price of the hay and corn, which horses must have necessarily consumed in the same time, being kept to equally hard labour.

LUG, *or* LUGG, the same with pole, or perch, a long measure of sixteen feet and a half.

LUPINES, a species of wild pea, cultivated principally as a manure.

Lupines require the least labour of any thing that is sown; and will thrive in any soil, except the chalky and miry; but delights particularly in poor hungry worn out land, especially if it be dry and sandy. If sown in February or March, after a single very shallow plowing, and slightly harrowed in, or even harrowed in without any plowing,

plowing, it will bloſſom three times between May and Auguſt, and prove an excellent enricher of the ground when plowed in juſt after its ſecond blooming: though Mr. Miller, holding the lupine to be a very great impoveriſher of the ground whilſt it grows, thinks it is ſtill better to parboil the ſeeds, to prevent their ſprouting, and then to ſtrew about ſixteen buſhels of them upon an acre of land, and plow them in. In warm countries, lupines are much ſown in vineyards for this purpoſe only, and are found to be one of the beſt manures that can be laid to the roots of the vines. Their ſeeds ripen towards the end of September, or in the beginning of October. They are very bitter: to remedy which, the Spaniards and Italians, who feed their cattle, horſes not excepted, with them in winter, ſteep them in river water and ſalt till that bitterneſs is gone, and afterwards dry them thoroughly over a fire, or in the ſun. They even make bread of them, when corn is very ſcarce, and put them to ſeveral other culinary uſes. The beſt time for mowing them is after a ſhower of rain, becauſe the ſeeds drop eaſily out of their pods when they are gathered to dry. They muſt, however, be laid up very dry, or worms will ſoon breed in them. The red and the blue lupines, which are frequently planted in our gardens by way of ornament, grow wild, and in great quantities, about Madrid.

LYE, a fluid impregnated with ſalts, &c. *See the article* STEEPS.

LYNCHETS, or *Linchets*, graſs partitions in arable fields.

M.

MADDER, the Engliſh name of a plant, cultivated with great advantage in ſeveral parts of Europe, and lately in England, being a very capital ingredient in the dying buſineſs.

There are ſeveral ſpecies of madder, all of which afford a dye. M. Guettard, of the Royal Academy of Sciences, has experienced that the ladies bed-ſtraw, or cheeſe-rennet (gallium) may be made to yield one; and of this kind is probably the Ray-de-chaye, which is uſed on the coaſt Coromandel for dying red. M. Dambourney has not, indeed, as M. Duhamel remarks, hitherto been able to extract a good colour from the gallium: but there yet remains room to hope that he may be more ſucceſsful in the future experiments which he intends to make on this root.

Mr. Ray mentions and deſcribes four different kinds of gallium or mollugo, baſtard madder, which, after the laudable example of our enterprizing neighbours, ſhould likewiſe afford matter of experiment to thoſe who wiſh well to this country, and particularly to our dyers.

The azala or izari of Smyrna, perhaps more properly written hazala or lizary (according to the eaſtern method of pronunciation) which is the ſort uſed by the French dyers at Darnetal and Aubenas, to give cotton that fine carnation colour for which Adrianople is famed, is a true madder. Some ſpecies of it grow naturally under hedges and in woods; and the roots of theſe, when carefully dried, yield as fine a dye as the azala of Smyrna. M. Dambourney has cultivated a ſpecies of madder which was found growing wild on the rocks of Oiſſel in Normandy, and the roots of this plant have yielded him as beautiful a dye as the azala of the Eaſt. We ſhall hereafter ſpeak of it in his own words: but in the mean time we cannot help obſerving here, that Mr. Ray deſcribes particularly a wild madder which grows not only on the St. Vincent's rock near Briſtol, but alſo on the rocks about Biddeford in Devonſhire, and in great plenty among the hedges almoſt all over that county. As Mr. Ray calls this the *Rubia ſylveſtris Monſpeſſulana major*, and as M. Duhamel ſuſpects M. Dambourney's Oiſſel madder to be that very ſpecies, it ſurely is a matter of great importance to this nation, and well worth the attention of patriots, to follow M. Dambourney's example in making proper trials of it.

The ſpecies moſt commonly cultivated is the *Rubia tinctorum ſativa*, J.B. III. 2.714. and C.B. Pin. 333, commonly known among us by the general name of madder. It is of this ſpecies that the plantations of madder are made in Zealand, and in the neighbourhood of Liſle.

The following method of cultivating this uſeful plant was ſent to the editors of the Muſeum Ruſticum, by a gentleman who has been a practical grower of madder for ſeveral years, and tried it upon land of various kinds.

My firſt trial, ſays he, was upon a ſmall piece of ground near my houſe, of about forty perches of land, lying pretty low and moiſt, of a deep mellow ſoil, and rich black mould, a little inclining to ſandy; and underneath about two feet and a half, and in ſome places three feet of good earth, was a bed of looſe ſand, with a mixture of gravel.

I have been the more particular in the deſcription of the nature of this land, becauſe it produced the beſt Engliſh madder I ever had, both as to quality and quantity.

In March I cauſed this plot to be dug a full ſpit deep; and as it was under natural graſs for ſome years before, I took care in digging to throw the top turf as low as poſſible, turning the mould uppermoſt, in order to prevent the graſs from ſpringing; which had the deſired effect. I alſo took care to pick out all the roots of weeds, and other noxious plants, which were found therein.

In this ſtate it remained about a month; then with a line I divided it into beds of five feet wide, and two feet interval

interval between each bed, raifing them a little in the middle with fome of the earth in the intervals; then with iron-rakes the beds were reduced to a fine garden-mould, leaving them a little rounding, like afparagus beds, in order to fhoot off the rain-water; and having procured fome ftrong packthread, at every foot diftance I tied a fmall piece of white woollen-yarn, and thus continued the whole length of the line, which afterwards ferved as a rule where to fix the plants.

This line was extended the whole length, upon the outermoft bed, fix inches from the fide ridge of it; then with iron-fhod dibbles a madder-plant was fet ftrong in the ground, near every tuft of white yarn fixed along upon the line.

This row being thus planted, the line was removed two feet forwards, which brought it exactly to the middle of the bed: this being alfo finifhed, the line was again removed two feet, and planted as before; and this method I continued till the whole was planted. Thus there were three rows of plants in each bed, at two feet diftance, and one foot apart in the rows; and the diftance between the innermoft row of one bed, and the outermoft row of the next adjoining bed, was three feet.

During the firft fummer I kept the young madder quite clear from weeds, by hand-hoeing, as foon as any appeared: and in October following I took the haulm, that overran the intervals, and fpread it over the beds, without cutting any off; then with a fpade I covered the haulm with the earth from the intervals about two inches thick.

In this condition it remained during the winter, and in March following, the young madder came up very thick and ftrong; and as faft as any weeds appeared, I kept them down by hoeing, as before; but in the fecond fummer I found there was no neceffity of repeating the hoeing after the middle of June, for the haulm was now grown fo very luxuriant as entirely covered the furface of the ground, and thereby prevented the weeds from growing; and in October I again fpread the haulm upon the beds, and covered it over with the earth in the intervals, as before.

There are three good reafons for covering the madder in winter.

The firft is the new dreffing of the beds with frefh untried earth.

Secondly, by this method deep trenches are formed at proper diftances throughout the whole plantation, and confequently the beds are kept dry and healthy, and thereby the roots are prevented from rotting, which otherwife they are apt to do, if the water continues too long foaking on the beds.

The third reafon is ftill more efficacious; for by this means the haulm is entirely rotted, and the volatile falts contained therein are wafhed down to the roots by the winter rains, which tends more to encreafe the vegetation of the plants than double the quantity of any other fort of manure whatfoever, and for this reafon, becaufe the falt, inherent in the haulm, is of the fame kind with that which was before extracted out of the ground by the growing of the madder, and is now returned into the earth again, in order to renew its former office of vegetation.

This, perhaps, may feem new doctrine to moft of your readers; but experience convinces me of the truth of it, not only with regard to madder, but likewife in the propagation of afparagus, which, in a future letter, I may, if I have leifure, explain more fully, by giving the public an account of my making and managing thofe beds.

If this hint was duly attended to, it is my opinion that both farmers and gardeners would find their account in it, in the production of moft forts of vegetables.

But to return more immediately to my fubject.

In the third fummer very little work was required, only two flight hoeings in April and May, owing to the ftrength of the haulm, which covered the ground as in the preceding fummer; and in October following the roots were taken up, and this fmall piece of ground produced one thoufand nine hundred and fixty-five pounds of green roots, which were very large, and the madder, upon trial, found to be exceeding good.

In cultivating madder, great care is to be taken to fee that every fet or plant has fome fmall fibres at the root; and this ought particularly to be obferved by thofe who are employed in taking them out of the ground; for unfkilful perfons, not ufed to the bufinefs, very often draw up fuch as have no fibres at all, and then they certainly mifcarry.

The beft way is, to remove the earth from the mother-plant with a fmall hand-hoe, or fome fuch inftrument; and then you may eafily find which of the young plants has fibres, and which not.

In the fecond fpring you muft be cautious not to take off above two or three fets from each root; but in the third fpring, when they are deeply rooted, you may take off almoft as many as you pleafe, without injury.

The fooner the young plants are fet after they are taken up, the better; and if you are obliged to have them at a diftance, fo that they cannot be fet again in lefs than three or four days after they are taken up, they muft be well watered at firft planting, and repeated as often as you fee occafion, till they have taken root.

In dry feafons, the young plants very often die for want of moifture foon after they are planted; and in large plantations the expence of watering would be too great; therefore I always get my land ready early in the fpring, and wait for fome fhowers falling; and when I find them juft at hand, and fometimes in the rain, I get a great many hands, and immediately go to work, fome taking up, and others raking and planting; fo that the whole is foon finifhed, even in a large piece of ground; and when the plants are well watered at firft, they foon take root, and afterwards they will ftand a dry fummer very well.

In the moft favourable feafons, fome few plants always die foon after they are fet; therefore, about three weeks after planting, you muft go over your madder-ground, and replace fuch as have failed, with the beft and moft likely plants; and if the feafon be dry, let them be well watered at firft planting; but, if after all, you find any mifcarry, (which, in a dry fummer, they fometimes will do) the beft way is to fill up the vacancies, with winter-plants, in October following, juft before you cover the haulm.

Madder may be fuccefsfully planted from the middle of March to the end of May, according as the fpring is either forward or otherwife; but if fhowers fhould happen to fall in April, this is the beft month in the year for planting madder. There fhould be no dung of any kind laid upon the ground during the time the madder is growing, becaufe it has been found to give the madder a bad colour; and if the land is in good heart, and proper for the purpofe, there will be no need of it.

It cannot be expected that any land, even the richeft, fhould produce repeated crops of madder; for which reafon I am told, that the Dutch always allow an interval of fix or feven years, in which time they manure the land very well, and fow it with corn or garden vegetables, and have always large crops, owing to the deep ftirring of the ground, and being clean from weeds; and I can, from my own experience, affert, that the beft crops of corn always fucceeded a madder-crop.

About five years ago, I planted an acre of madder on a light, dry, fandy foil, which produced a tolerable crop, but nothing equal to the other.

I likewife tried it upon an acre of land of a loamy, mellow foil, fomewhat fandy, about a foot deep in mould; and undearneath is a cold, ftiff clay: from this piece I had great expectations, as the plants thrived very well at firft, but in the fecond fummer, when the roots reached the clay, the plants died away, and came to nothing; therefore I am well fatisfied a cold clay is by no means proper for madder.

I have alfo, at this time, two other acres of madder, which I intend to take up next winter; it will then have ftood three fummers. The foil is a deep, hazel mould, worth about twenty fhillings per acre. Inftead of digging it with the fpade, I plough-trenched it at leaft eighteen inches deep, but managed, in all other refpects, like the former. From the appearance it made laft fummer, I have no great expectations from this plantation, though, I fancy, it will be a faving crop.

Expences

Expences attending the Culture of an Acre of Madder, supposing the land to be worth forty Shillings per Acre.

	l.	s.	d.
Rent for three years - - - -	6	0	0
Digging ditto at two-pence per perch -	1	6	8
Dividing ditto into beds, two men one day, at one shilling each - -	0	2	0
Raking ditto, two men one day, at one shilling each - - - - -	0	2	0
Planting ditto with two thousand plants, one day, at one shilling and sixpence each	0	3	0
Six women to take up two thousand ditto, at six-pence each, one day - -	0	3	0
Hoeing the first summer five times -	0	15	0
Covering ditto in autumn the first year	0	6	0
Hoeing ditto the second summer three times	0	9	0
Covering ditto in autumn the second year	0	6	0
Hoeing ditto the third summer twice -	0	4	6
To be paid in lieu of tythe, at five shillings per acre per annum - - -	0	15	0
Digging ditto out of the ground -	5	0	0
Total of expences	15	12	2
As I always allow my people beer when they are about this business, I may add -	0	6	0
Which brings the whole expence to	15	18	2

In the above account I have not reckoned any thing for the plants; for though they cost considerably at first, yet it is then done once for all, to any person who continues to propagate madder, as he has always a constant supply from his own plantations.

	l.	s.	d.
Produce of an acre of madder -	52	12	6
Expences - - - - -	15	18	2
Clear profit - - -	36	4	4

In the business I follow, which is that of a clothier, a great deal of madder is used in dying; and being of opinion that there are many useful discoveries now lying dormant, only for want of proper methods to bring them to light, I determined to try an experiment on madder; accordingly I took twenty pounds of the green root, and having washed it clean from dirt and filth, I bruised it in a large iron mortar, just before using, and with other ingredients I dyed half a pack of wool of a dark, full drab: upon examining my colour, I found it full as good as tho' I had used four pounds of the best umbro madder, imported from Holland; so that, according to this calculation, which is founded on experiment, five pounds of green madder-root is equal to one pound of dry manufactured madder; and as I have found this method to answer, I have continued to use the root in this condition ever since, and find it much the best and cheapest way; for the green root is bruised very easily in the mortar, and thereby saves a great expence in drying, pounding, &c.

Before I quit this subject, I would advise those persons who are inclined to cultivate madder, to be very cautious in the choice of land for this purpose; for hereon their success chiefly depends. Madder being a plant that draws a great deal of nourishment, consequently the richest and deepest lands are to be chosen, and such as lie pretty low; for high lands are seldom fertile.

The following method of cultivating madder, was communicated to the public by M. de Salens, a French gentleman, who is well acquainted with this branch of husbandry.

I am apt to think, says he, there is hardly any kind of soil, but what madder will grow in; but it does not thrive alike in all: on the contrary, scarcely any plant sooner discovers the richness, or poverty of land, by the state of its growth, than madder: in rich land, and a soil that agrees with it, it is luxuriant, and produces a great number of sizeable, well-conditioned roots; but in a poor, dry, hungry soil, the plant is visibly checked in its growth, and the roots of it are small, and few in number.

Madder is a great friend to moisture, and therefore thrives best on a good loam, with a clay bottom. It is very fond of fresh land just broke up; but it must be so situated as not to be subject to be overflowed, as that will destroy the plant.

Madder requires, to come to a state of perfection, a great deal of nourishment; yet it is said not to impoverish the land; and this, in fact, is evident; for when the madder is dug up, the land will be in excellent condition to bear a good crop of wheat.

I have tried several ways, and at length am of opinion, that the best method of raising madder in France, is from the seed: it occasions, indeed, at first, some delay; but by continuing to sow a quantity in the nursery every spring, you will never fail of having plenty of plants.

The seed must be sown on a bed of earth, dug well, and made very fine by the rake, with which instrument the seed must be slightly covered.

When the plants appear, they must be carefully weeded, and set out with a hoe: the bed must, during the whole first and second summer, be kept very well hoed, and clear of weeds; and, if this is done, they may be planted out the second autumn.

I have many reasons for preferring this method in France; but I shall forbear giving a detail of them, because my opinion, with respect to planting madder in England, is different.

The seed of madder does not ripen so well with you, as with us; neither does it, as I have been informed, take so well on being sown. For these reasons, I would recommend it to you, to make your plantation with shoots that are put forth by the old roots in spring. I have practised this method, and met with success.

For madder to succeed well, there should be a great depth of good soil, and it should be turned up very deep with a plough, or, what is much to be preferred, with a spade. When the ground is properly prepared, it should be planted with sets, being the spring shoots pulled up in a madder-plot, with some root to them; for, if they have not some root and fibres, they will not take kindly: these shoots generally come from the layers of the plants, and great care should be had in taking them up, or the crop of madder will be damaged: the best way of doing it is with a dibble that has a flat edge shod with iron; this, on being thrust into the ground, cuts off the root at a proper length, and by gently declining the handle of the dibble, raises the set, without injuring the fibres of the root; and great care should be had not to take up too many of these shoots, or stalks, as they are undoubtedly necessary to the support and thriving of the principal roots, which, were they deprived entirely of their stalks, would certainly perish.

It is scarcely necessary to inform you, that as fast as these sets are taken up, they should be immediately replanted.

To make the method of planting these sets more intelligible to you, I must observe, that they are planted nearly as potatoes are planted in Ireland; that is, a straight furrow is drawn, the sets are put into it, the earth of the second furrow is thrown over them, the second furrow is filled with sets, &c. and so on till the whole ground is planted.

We place the sets here within three inches of each other; but this I think is too near for good land: perhaps they would thrive better, was double the space allowed: when three rows are planted a foot asunder, we leave an interval of four or five feet, according to the state of the land.

Grounds planted with madder, always succeed best when gentle rains fall soon after the work is done, as the sets take root the readier, and the whole gets into a thriving way.

In Holland and Flanders, their method of planting differs from that above described: they take up their sets from an old madder ground in May, and they plant them again immediately with a dibble, about three inches asunder, in rows about fifteen inches from each other; they form their beds about ten feet wide, and leave intervals of only one foot and a half, or thereabout.

The best time of planting a madder-ground is undoubtedly in autumn, as the sets are then best furnished with roots,

roots, and the rains which commonly fall at that season forward their growth.

As the stalks of the madder-plants are to be laid down and covered with earth, the intervals should be every now and then stirred to keep the soil loose. This covering is done when the stalks are about fourteen or fifteen inches long: after the ground has been well cleared of weeds, a part of the shoots in each row are laid down in the intervals on the loose earth, and slightly covered with the same earth; observing, however, not to cover them entirely: the end of each shoot should be left out of the ground, or they will not grow, and the whole work would be thrown away. The intention of laying these shoots down is, that they may be converted into roots, and thereby increase the quantity for sale; but all the shoots must not be laid down, or the disproportion betwixt the stalks and the roots would be too great.

This work may be done with great ease with the common implements: let a furrow be opened close to each side of the bed with a plough: in these the shoots are laid down, and covered slightly with a hoe.

None of the stalks of the madder should be pulled up the first year, as it would too much weaken the roots by disturbing them, and tearing off their fibres.

After laying down the shoots the first year, the madder-ground requires no farther care, except being kept clear of weeds; and in the autumn of the succeeding year it may be taken up, in order to its being prepared for sale: the earth of the intervals must always be kept loose by tillage.

When the madder-roots are taken up, the whole land gets a thorough ploughing, and some fresh roots or sets are regularly planted in rows, in the intervals of the former year; and when this second crop of madder is off, the land will be in fine condition to bear excellent crops of corn; for madder is no impoverisher of land, and the frequent tillage it requires, brings the land into fine tilth, reducing it into as small particles as the bed of a well-kept garden.

The best husbandry is, not to plant the same land in madder for many years afterwards; and whenever it is again planted with that crop, it should be well dunged, manured, and tilled, the preceding year.

When the stalks begin to wither, that is, about the latter end of October, the roots are to be taken up; and the cheapest and shortest way of doing it, is to loosen the earth with a common plough, first taking off the earth-board and coulter: when the earth is thus loosened, women and children may serve to pick up the roots; and wherever any difficulty occurs, the labourers turn up the soil with their spades.

But a much better, though rather more expensive method is, to have the earth of the beds turned into the intervals with a three-pronged fork: by this method the roots are taken up almost without damage; and many which lie a little deep are saved, but which would otherwise have been left in the ground and lost; and particularly most of the vertical or tap-roots are got up.

When the roots are taken up, they are dried as much as possible in the air, afterwards carried to a kiln, and lastly to the mill to be ground.

A light loamy soil is better for madder than a rich strong clay; it loves moisture, but is killed if it is overflowed: therefore, if the soil is in other respects proper, but too wet, it must be first drained, or at least the beds must be raised high, and the intervals sunk low: on the other hand, if the land is too dry, the intervals may safely, and even profitably, be raised above the beds: this will at least prevent the young fresh planted sets from being hurt by too much drowth.

When the upper stratum of soil is deep, it is to be observed, that the land cannot be stirred too deep: the only thing to be apprehended is the expence of doing it: the more the earth is reduced, the more nourishment will it afford to the roots of the madder; they require a great deal: but in general madder pays well for any labour that is bestowed on it.

Dry weather is, if possible, to be chosen for taking up madder roots, as the earth then easily falls off them, and they need not be washed, which is to be avoided; and, in fact, there is no occasion to wash them, unless they grew in a stiff soil, and the weather was very wet when they were taken out of the ground.

Some judgment is required respecting the time of taking up these roots: I have already mentioned that they will, in general, be fit for use by the latter end of the second autumn; but this is not always the case; and it is much better to let them lie in the ground another year than to spoil a crop.

The Dutch often taken them up too small, and the French almost as often let them grow too large. The two extremes are equally to be avoided: the proper time to take them up is, when they are about the size of a swan's quill; they then yield most dye, and are of course most proper for use. The time when they arrive at this proper state, depends not only on the nature of the soil in which they have been planted, but also on the good husbandry that has been bestowed on the land; for without proper tillage they will turn out but an indifferent crop; but if they are planted on a good loam, are well tilled during their growth, and have favourable seasons, they need never be left in the ground longer than the end of the second autumn, whether they are planted in the spring or the autumn.

I have mentioned in this letter many things which will appear trifling to you, when experience has made you more knowing in this culture; for, depend upon it, a greater portion of knowledge is acquired by a little experience than by a great many precepts; the first makes a deep impression on the mind, whilst the latter are soon chased away by new, and perhaps more pleasing ideas.

I would recommend it to you, when you begin to plant madder, to depend more on the judgment you shall form of things, than on any thing you can read on the subject. If you miscarry in some instances, you will certainly rectify matters in your future practice: a sensible man cannot be long in the wrong.

I have not, I know, given you any systematical instructions in the affair of cultivating madder; and this I purposely avoided doing; for, had I attempted telling you in what manner this useful plant ought to be cultivated in England, I should certainly have miscarried, and all I could have said would have amounted only to probable conjecture: had I, on the contrary, given you a circumstantial detail of our methods of practice here in France, it would only have served to mislead you, so much do the climates of the two countries differ. I am therefore in hopes, that my manner of treating the subject will be not only more agreeable, but more useful to you, as I have, for the most part, only mentioned such circumstances as may be equally useful in the culture of this plant in both countries.

Lay it down as a maxim, that the culture of madder, if properly managed, is very profitable; there are few crops pay better; but then the two extremes are to be carefully avoid; we must not let our expences be so large as that no crop will repay them; neither must we be so sparing as to baulk the growth of the plant for want of proper tillage. A great deal is required, yet too much may be bestowed on it, for the reason above mentioned: the golden mean is best in this, as well as in all other matters; and what this mean is, can only be learnt from experience; for it is absolutely impossible to lay down maxims that will suit all countries, all climates, and all soils.

What has hitherto been said relates to the common way of cultivating madder; we therefore shall now give in his own words, the great improvements made in this article by the ingenious M. Dambourney.

"M. Rondeaux, says he, found, eight or ten years ago, on the rocks of Oissel, two plants of madder, which he took up and set in his botanic garden. He afterwards gave me some slips of them, and I planted them in a similar place, out of curiosity: but M. Du Hamel's treatise soon made me perceive the importance of cultivating this plant. I accordingly applied myself to it: and by following all the methods which had been pointed out to me, and those which seemed to coincide with them, I succeeded so far as, in four years, to have plants enough to try this culture in the open field. In the mean time I learnt that M. Peter Dupont cultivated with success, at Elboeuf, plants of madder which he had received from Lille in Flanders.

ders. He was so kind as to make me a present of an hundred sets of them; and this little reinforcement, added to what I had raised of my own, obliged me to seek for room in my garden at Oissel, wherein to extend this culture. Finding no other spot vacant there, but two walks, I sacrificed the pleasure of enjoying them, to my then new and prevailing inclination. I therefore dug up one of them, the soil of which is a yellow and sandy clay, underneath which, at a spade's depth, is a bed of large gravel, close knit with very strong earth: but I did not suffer this to be broken into. I divided the walk lengthwise, and, without dunging it at all, planted in December 1757, in one half of it, first the sets which I had received from Elboeuf, and then, immediately after, but without mixing them, those which I was able to take from my own plantation. The other half of the walk was sowed in the month of April 1758, with seed which I had gathered from my own plants. The other walk was disposed of in the same manner, as fast as I could get plants or seed to stock it; taking care the first year to keep my beds well weeded, and to lay down the branches as fast as they shot out.

"So early as in the autumn of 1758, I gathered seeds from my plants of Oissel madder, whether raised from seeds or from slips; but that of Elboeuf had not then blossomed, though it had put forth stalks three feet high; and even in 1759, it produced blossoms on only a few stalks, whilst the Oissel madder was loaded with them. When the stems were withered, I had the curiosity to take up some of the roots, and was thereby informed of the following interesting facts.

"1. Though it is said positively, in the Dictionnaire Encyclopedique, that madder raised from seed requires five years to grow to the same size as that which is raised from slips attains to in eighteen months, yet I found all things equal in this respect; and if there was any sort of advantage on either side, it was in favour of that which had been sown: both the one and the other occupied the whole depth of the ground so far as it had been loosened, and their roots had, in several places, penetrated through the hard bed of gravel underneath: but in order to pierce through it, three or four roots had twisted themselves together, and shaped themselves exactly to the form of the passage they found between the pebbles, in consequence of which they were more or less choaked there; though they afterwards resumed their natural shape and plumpness in a bed of small pure sand which lies underneath the hard bed, and in which I have been obliged to leave some of them at the depth of four feet.

"It is plain therefore, from this instance, that no time is lost by raising madder from the seed, and that this plant may be raised successfully in the most indifferent soils, even without the help of dung.

"2. I took advantage of some fine days to dry in the sun, but separately, the roots which I had taken up. Every thing seemed to give the preference to those of the Elboeuf species. They were larger and redder than the others, and their powder was finer to look at: but the effect proved very different. To make a fair comparison of them, I dyed, with equal quantities of each of these sorts of madder, two equal parcels of cotton prepared in exactly the same manner: that which was dyed with the madder originally of Oissel took a much brighter colour, and resisted during thirty minutes a boiling which the other could not bear during ten. I likewise compared its effect with that of the Lizary or Hazala of Smyrna, and the advantage, as well in point of brightness as of the durableness of the colour, was also on the side of the Oissel madder.

"This valuable kind appeared to me from that moment to deserve the preference. In the spring of 1760 I sowed all the seed I had of it, part upon hot-beds, and part on beds in my kitchen-garden; and I desired M. Rondeaux to help me to find out more plants of it upon the rocks of Oissel or of Orival: but he assured me that he had searched for such several times, in vain: nor was he more successful in a journey which he took thither last August, with M. Dangerville.

"I therefore determined to have recourse to the suckers which grow around these plants: but though I took them up as carefully as possible, I could scarcely get any that were rooted; and notwithstanding that most of those which I did plant were yellow for the length of from four to eight inches, yet nine of them in ten died. The offsets of the Elboeuf madder, on the contrary, though taken up with but little precaution, have a great many fibres and young roots, and their taking fresh root is sure, provided they are planted in cool weather. Nature seems thus to compensate the cultivator for the scantiness of the seed which this last species produces, whilst the other yields it in abundance.

"Not to neglect any means of multiplying the Oissel madder, I dug up a small spot of it, about the fifteenth of last June, and took from thence all the slender roots which run in great plenty just below the surface of the ground: I cut them into pieces at every second joint, and planted them the same day in channels, where all those that were brown and woody became good plants, and those which were then only yellow and tender rotted.

"The doing of this taught me what I had not learnt from M. Hellot's memoir, nor had any of my correspondents in Holland informed me of it; namely, from what part of the root it is that the most valuable colour is obtained. After all my runners were thus taken off, and replanted, there still remained the stock furnished with lateral and with descending roots, resembling in form and colour large earth-worms. In three days of sun-shine they were dry, and the parenchymæa, or pulpy part of the root, being then lessened in bulk, the outer skin became wrinkled, because it was then too large. To clear them of this wrinkled skin, I had recourse to a method first thought of by M. Paynel of Darnetal, which was, to put these roots in a large sack of coarse canvas, and to shake them strongly therein. The friction of the sack, and of the roots one against another, took off almost all that outer skin, which I afterwards separated by winnowing, and what then remained was that which alone ought to be called fine and true peeled bunch madder, the effect of which is as superior to that of the azala, as the azala is superior to the finest Dutch madder. I would not however advise the cultivators of madder to follow this method, any farther than there may be curious and nice buyers ready to give them a price proportioned to the expences it occasions.

"By thus taking up each species of madder in the spring, one has, as M. Du Hamel gives room to hope, not only the advantage of obtaining suckers and joints of roots for raising new plants, but also, if the season be not quite unfavourable, one may dry the root itself in the sun sufficiently to make it keep, and by this means the expence of drying it with fire in a stove is saved, and the injury which the fire does to the quality of the madder is avoided. The colouring part would be still more valuable, if the root were dried in the shade under a shed open on all sides; and to accelerate this drying I have successfully made use of a bed of half-baked bricks, upon which I have spread the fresh roots. A bed of dry ashes, six inches thick, may also be used: but in this case it must be covered with cloths upon which the roots must be laid, that the ashes may not mix with them when they are turned. A floor of plaister likewise facilitates this drying; and I believe it far preferable to bricks, on account of the ferruginous parts which these generally contain.

"The principal difference which distinguishes the Oissel species is therefore observable in its roots, which are slenderer, of a less bright colour, less furnished with fibres at their joints and those joints farther asunder, than in the Elboeuf madder: but, besides this, an attentive eye will discern many more distinguishing marks.

"In the spring of the second year it rises ten or twelve days earlier than the other sorts, its stalks are slender, and they trail upon the ground as soon as they are a foot long; its leaves are of a pale green, long, narrow, thin, waved along, their edges (pretty much like that of the laurel); its blossoms are disposed in loose spikes, and each of the seeds which succeed those blossoms stands upon a pretty long foot-stalk.

"The Elboeuf madder, which came originally from Flanders, and is the same as the Flemish refugees carried into Holland, puts forth, on the contrary, strong stalks, which have frequent joints, and are able to support themselves even when they are two or three feet long. Its leaves, which are of a deep green, are thick, broad at their

their base, and terminate in a point almost like the leaf of the great mirtle, and they are not at all, or very little, waved. It does not blossom till the second or third year: its flowers are very apt to fall off, and when this accident does not happen, its seeds stand on short foot-stalks. This seed grows very well: but the ease with which well rooted shoots are obtained from this species renders it the less valuable.

" In order to enlarge my plantation, and likewise in hopes of enriching it with a new species, I wrote to Smyrna for some seed of the azala or izary, and luckily received three pounds of it on the 20th of August 1760. It seemed to me absolutely like that of the Oissel madder, and I ventured to sow a small part of it, on the 27th of August, upon an old hot-bed which had lost all its heat. It rose well, and the young plants were not injured by the winter. I transplanted them into open ground at the end of last February, they are now in bloom, and their appearance is exactly like that of the Oissel madder, excepting that their stems are slenderer.

" As to the culture, I set out with scrupulously observing M. Du Hamel's directions: but afterwards I ventured to deviate from them in some points, in order to adapt it to the less attentive genius of our farmers. In the first place, I have experienced the truth of what M. Paynel of Darnetal observed to me, viz. that the plants which are raised from layers, at a great expence, produce only long woody roots, which yield hardly any colour, remain hollow during two years, and produce very few of those vermicular roots, which are the only valuable ones. I have therefore quadrupled the number of plants in a given space; the ground has been well filled with them, and the expence of making layers has been saved; and, thoroughly to accommodate the culture of this plant to the practice which our country people are accustomed to, I have either planted the slips, or sowed the seed, in rows after the plough, as is done for kidney-beans, and the workman used to earth up these performs mechanically the same operations for the madder, the expence of cultivating which in this manner is no more than that of raising those beans in the field.

" Having observed that the east winds in the spring, and the heat of summer, are equally fatal to whatever is then set in the lands about Oissel, and that, on the contrary, whatever will bear planting in the autumn succeeds very well in them; I took up in October last all the plants of two years old madder that were in my garden walks, and these afforded me as many slips as were sufficient to plant half an acre of ground. Very few of them failed, because they were all brown and woody. But as the roots which are taken up in autumn, and which one might wish to be able to keep, cannot be dried without fire; it is advisable to dig up in that season only the quantity necessary to furnish sets for replanting, and from June to September to take up what is intended for sale.

" On the 16th of last February I sowed in a hot-bed the greatest part of the Lizary seeds which I had received from Smyrna, and the rest of them a fortnight after in one of the beds of my kitchen-garden. I raised from them plants enough to stock four hundred and forty square feet of ground, in an open field, where they succeed perfectly well: but this transplanting checks their growth; so that if the seed is sown in the field in May, the crop will be in nearly equal forwardness: but I have not had cause to approve of sowing it earlier in open ground.

" As it is right to make even inconveniencies become lessons of instruction, the impossibility of drying without fire the roots which I took up in October, put me upon trying to use them fresh, in the state they were when dug out of the ground. I therefore washed them well, that no earth might remain upon them: but having myself experienced that, as M. Du Hamel observes, this root loses seven eighths of its weight when it is dried sufficiently to be reduced into powder, I judged that I must proportion my quantity accordingly. I therefore put into a quantity of liquor which would have required a pound of powdered madder, eight pounds of fresh roots bruised in a mortar, and with this I dyed some cotton, in the usual way. When the dying was finished, I found that the liquor was still over-charged, though the cotton had imbibed so deep a dye as to require two boilings to bring it down to the usual colour: upon which I repeated the experiment with six pounds, and afterwards with four pounds, and I found that this last proportion of undried roots is that which gives a colour equal to what is extracted from a pound of dried and powdered madder. One half of the quantity of roots commonly used may therefore be saved by dying with them when they are fresh dug: but, though this is a great saving, it is not the only one.

" 1. There is no need to build kilns or sheds for drying the roots in changeable weather.

" 2. One is exempted from the inconveniences of a too hasty or too slow drying, either of which is equally hurtful to the quality of the madder.

" 3. The waste occasioned by the peeling, garbling, winnowing, &c. of the roots, in the doing of which many, if not all of the small ones, that are not for example thicker than straws, are separated with the refuse parts, and thereby generally lost, is hereby saved.

" 4. The expence of grinding is saved, together with the waste and fraud which may be committed at the mill; and likewise the inconvenience of waiting till the mill is at liberty, which is of no small consequence in places where there are not mills appropriated to the grinding of madder only.

" 5. Lastly, the roots thus used do not evaporate or ferment, as the powdered madder always does if it be not speedily used.

" All these advantages put together may be deemed equivalent to a saving of five eighths in the quantity. The planter who knows how to dye may reap the benefit of them the moment that his roots are large enough to be taken up: the dyers by trade will by degrees be sensible of the advantage, and share the profit with the planter, when the madder grounds are nearer them: they will even find themselves under a necessity of so doing whenever this method shall become general, and this will be a means of rendering it such; for as there is no particular time to be waited for in order to the madder's acquiring maturity, after it has been planted eighteen months; the husbandman who carries a parcel of fresh roots to market will be sure of selling them in that state, and the dyer may buy them daily, in proportion to the quantity he wants; or he may agree with the planter for such and such quantities to be delivered to him at such and such times. I have moreover experienced that these roots may be kept fresh during several months, by laying them in a hole three feet deep, in alternate layers of roots, and of earth.

" This experiment pleases me again in its tending to lessen the expence of dying, and consequently to reduce the price of our dyed stuffs at foreign markets, by which means our trade with other nations may be benefited: and it is likewise new, since neither M. Hellot nor M. Duhamel have pointed it out. I have also experienced that the Elbœuf madder is very good when it is used fresh; a circumstance by so much the more important to be known, as this species is not only the longest lived of any, but also the most easily propagated.

" The principal difficulty now remaining for me to surmount, is to find out some cheap and easy way of taking up the madder, without leaving in the ground its descending roots, which yield the best colour; for the method which I have hitherto practised has been considerably expensive. M. Duhamel proposes a plough which turns over the earth, without a coulter: but if I may judge from what I have seen, this expeditious instrument can suit none but lands where a clayey bottom hinders the vermicular roots from piercing deep. I wrote to Holland, to know how the Dutch manage in this respect: but those zealous patriots are very reserved in every thing relative to this plant, of which we let them be the monopolizers: I was answered, that they use the spade and the fork. However, I shall try what my zeal and what incidents may suggest to me, and shall communicate whatever I may find to answer best.

" An objection which may, perhaps, be started against this branch of husbandry in France, is that there may be danger of its prejudicing that of our corn, which is an article of the greatest necessity. But besides that we have immense tracts of uncultivated lands where it might be established, I can, with M. Duhamel, assert, that the profit of the madder may be had in the best fields of this province (Normandy) without diminishing the crops of the most valuable

valuable corn. In effect, it remains in the ground but eighteen months, and after it is taken up, a single ploughing is sufficient to enable the land to produce very fine wheat, without any manure. Now it is the custom in all our wheat grounds to take a crop but once in three years, and this may be had after the madder. Nay, an advanage may be reaped even in the first year, by sowing, between the rows of madder, onions and other pot-herbs, which do not root deep or occasion much shade: but there will be a still greater profit in making it grow jointly with kidney-beans, because, the rows being regular, nothing would hinder the after-stirrings, which contribute so much to promote vegetation."

M. Dambourney continued his experiments on madder, and gives the following account of them.

"I have restricted myself to the three species which yield the brightest and most lasting colour: these are, the madder originally of Oissel, that which is sometimes found growing wild in the vineyards of Poitou, and the lizary or hazala of Smyrna. All these bear seed in their very first year, and in the second one may gather two thousand seeds from a plant which would not afford at most above twenty or thirty slips. The difference between these means of propagation is striking, and ought to be decisive in all countries where the seed ripens well, as it does in almost every part of France.

"The manner of raising it from the seed, as practised by me, is thus. Along a wall which fences off the north wind, let a trench be dug two feet deep, five feet wide, and of such length as may be most convenient; then, towards the middle of February, let it be filled with hot dung of horses or mules, well pressed down, to within about three inches of the level of the ground, and afterwards fill it quite up to the top with fine mellow mould, pressed down gently, and laid smooth with a rake. A bed of this sort is preferable to any other, because a common labourer can make it very well, whereas it would often be necessary to have recourse to a gardener to make a raised hot-bed. The expence is not to be regarded, because this bed may be sown six times in a year, and the mould which may be taken from it afterwards will be worth as much as the cost of the dung. The using of this bed does not at all prevent sowing likewise in the beds of a kitchen garden; but as this last should not be attempted before the middle of March, for fear of frosts, there will be a great advantage in sowing upon the hot-bed; for a month gained in this season is invaluable.

"On the 20th of February, 1762, I sowed upon such a bed some madder seed in small channels about an inch deep, and three inches asunder. This method is always preferable to sowing in broad-cast, because the seed is better covered, and the weeding is more easily performed. The young plants appeared after nineteen or twenty days, they were watered and weeded when necessary, and on the 30th of April they were fit to be transplanted into open ground.

"As most of our farmers are, unhappily, not able to advance money for a culture from which they have no prospect of reaping a return in less than eighteen months, I tried, last year, what would be the event of sowing madder at the same time as kidney-beans, and in the same furrows of the plough. The beans, which rise in less than eight days, required to be earthed up when the madder had scarcely appeared above ground; and this operation smothered the madder entirely. I therefore judged it most proper, this year, to substitute my young hot-bed plants of madder in lieu of the seed; and accordingly, when the weather was moist, for that is an absolutely necessary circumstance, I set some of my people to plant a piece of ground which had been well prepared for a crop of dwarf-beans. In each furrow of the plough where these beans were sown, women and children placed the young plants of madder six or seven inches asunder, fixing the root in the bottom of the furrow by means of a handful of earth put around it, and resting the green stem against the side of the furrow, the surface of which it exceeded by at least one row of leaves. The ploughman stopped a little at the end of the furrow, till the whole of it was planted: he then opened with his plough, which had a shifting mould-board, a second furrow, in which nothing was either sowed or planted; and at the same time the earth turned up out of this filled the first. A woman finished this filling with a rake, as well to cover the beans completely as to earth up the plants of madder. The third furrow was sowed and planted like the first, and this was continued till the whole extent of the ground was planted in rows fifteen inches asunder. This work, which did not in the least alter the common method of cultivating the beans (excepting that only two thirds of the usual quantity of seed were used) was performed in five hours, by one ploughman, three women, and three children. The ground thus planted contained upwards of twelve thousand sets of madder; and these had taken fresh root and had begun to shoot up when the beans rose. It was weeded twice, its surface was stirred, and the plants were earthed up as usual, without any danger. Both throve well together: the beans were pulled up when they were ripe, and the madder, now sole possessor of the ground, covers it like an artificial grass. The greatest part of it has yielded a little seed. The crop of beans, notwithstanding the drought of this summer, is almost equivalent to the expences, and next year I shall have that of the seed and roots of the madder, at the expence of only a stirring of the surface and a single hoeing in the spring.

"My hot-bed was no sooner cleared, than I sowed it again with madder: but the extraordinary drought of the season obliged me to leave it there till the 6th of August, by which means I lost a crop. I then took advantage of a rainy day to transplant it: and this was done in the same way as before, excepting, that the season was too far advanced to admit of sowing beans at the same time. The length of the roots of the madder likewise required more precautions to fix them with earth at the bottom of the furrow, in which one of the horses being forced to tread in order to open the next furrow, the whole would have been trampled to pieces, or dragged out of the ground. Yet the same number of work people as before-mentioned, set sixteen thousand plants in six hours. The spot is well filled, and the plants will be strong enough to resist the winter.

"On the 15th of May, being deceived by a small rain, I sowed near an acre of ground in alternate rows, as is practised for beans, but only with madder. I used for this purpose three quarts of seed, which I have much regretted; for the constant drought has hardened the surface of the earth so that the young plants have not been able to pierce through it, and consequently all has been lost. The method which I am now going to relate will prevent this inconvenience hereafter.

"I sowed my hot-bed, for the third time, on the 6th of August, with a design to let the young plants remain there all the winter, and not to transplant them till the end of February: but the nineteen or twenty days which this seed requires, in order to its sprouting, disconcerted me. It was necessary, in that hot season, to water frequently by hand, and this, besides wearying out the gardener, laid bare some of the seeds, which grew no more. It then occurred to me, that this might probably be remedied by sowing seed which had already began to sprout. Accordingly, I filled the bottom of a box with moist mould a quarter of an inch thick, then covered this entirely with seeds, and so proceeded in alternate layers, the last of which was of mould. I kept this box well watered, though exposed to the sun, and each day I examined the progress of the seed. It was on the eighth that the germ began to appear, and the very next day it was three quarters of an inch long. I seized that instant to lay in channels made in the hot-bed both the seed and the mould in which it had sprouted: I then smoothed the surface of the bed, and two days after all the rows appeared distinctly. This method likewise saved me a weeding, which I had generally found to be necessary as soon as the seed which had not been made to sprout before-hand had risen. The growth of the young plants was so rapid, that instead of letting them remain there all the winter, as I first intended, I ventured to transplant them into open ground on the 14th of last September. Frost is a little to be feared for this last plantation: the event will be a lesson for the future.

"Eight days before these plants were taken up, I laid another parcel of seed to sprout, in the same manner as before, and therewith immediately replanted my hot-bed. It has risen well, and will pass the winter there. I hope

hope (by thus uſing ſprouted ſeed) to be able next year to raiſe at leaſt ſix crops on the hot-bed. I likewiſe ſowed at the ſame time ſome of this ſprouted ſeed in a bed of my kitchen-garden, where it roſe in four days. I intend alſo to venture ſome of it about the end of next April in a ſpot with beans; and I preſume that as this already ſprouted ſeed will riſe ſooner than them, the plants of madder will be able to bear the firſt weeding and ſtirring neceſſary for the beans; in which caſe the expence of culture will be much leſs than the charge of removing the young plants, and both the hazard and the delay of their taking freſh root will be avoided. If this trial ſucceeds, it will be the greateſt inducement that can be for the farmer to adopt the ſame method, ſince it will require only one ploughman, a woman to ſow the beans after the plough, another to lay the ſprouted madder in the furrow, and a perſon to cover the whole over with a rake.

"The gathering of the ſeed is expenſive when one has but little of it, becauſe, for fear of loſing any of it, it is gathered almoſt ſeed by ſeed. I thought myſelf rich enough this year to try another way of doing this work. I cauſed all the tops to be cut off with a reaping hook when there remained upon them but a few ſeeds that were not ripe, and the whole was then laid upon cloths in the ſun. In two or three days the ſtalks and leaves became ſo brittle, that a few ſtrokes of a ſwitch reduced them into duſt. Two turns of a winnow blew away their duſt, and with it the unripe ſeeds, which, after they had been dried, were found to be lighter than the black or purple ones, in which the horney ſubſtance was formed. I hope next year to be in a condition to proceed with ſtill leſs precaution, that is to ſay, to mow at once all the branches and ſtems, and then to ſeparate the ſeeds from them in the ſame manner as before. It generally is during the whole of the month of September that the ſeed of madder is fit to be gathered.

"After the ſeed has been thus ſeparated from the ſtalks, and winnowed clean, it muſt be expoſed to the ſun till it becomes perfectly dry; for if there remains the leaſt mucouſneſs in the black pulp which ſurrounds it, a fermentation will enſue in the winter, or at leaſt a mouldineſs, which will deſtroy the germ. It muſt afterwards be put up in bags of thin cloth, and theſe ſhould be hung to the cieling of a dry and airy place, as well to preſerve the ſeeds from all moiſture, as from mice, which are very fond of them.

"If it be intended to ſow wheat after the crop of madder, the roots of this laſt muſt be taken up in the beginning of October. It is not poſſible for me yet to point out a better method of doing this, than to begin at one end of the field, and trench the whole ground two or three feet deep, whilſt women gather up the roots as the men purſue their digging. The ground is then ſo well prepared for wheat, without uſing any dung, that two-thirds, or at moſt three-fourths of the uſual quantity of ſeed, will be ſufficient to ſow it.

"The madder now taken up might become burthenſome to the planter, if the conſumer thereof ſhould ſeek to take advantage of the eaſe with which it corrupts: for the huſbandman would in ſuch caſe, be forced either to dry on kilns whatever he takes up in this ſeaſon, or to ſell it at whatever price the buyer ſhould be pleaſed to offer. Theſe inconveniencies ſeemed to me the greateſt obſtacles to the progreſs of this branch of cultivation, becauſe they neceſſarily required, in the common way of proceeding, either that kilns ſhould be built for drying the madder, or that its roots ſhould not be dug up till they were to be ſold. I therefore tried, as follows, to remove theſe diſadvantages. On the ſixth of October 1761, I dug in my garden, a hole three feet deep, into which I threw thirty plants of madder, then filled up the hole, and let it remain thus expoſed to the air and rain. I cauſed it to be opened on the 30th of laſt March, and found all the roots in good condition. It was filled up again till the 15th of September, when, upon its being opened anew, even the vermicular roots, the broken ones, and thoſe which had been ſeparated from the plant, ſeemed to me as firm and as ſound as when they were firſt put into it; but to be certain whether they had not ſuffered ſome alteration imperceptible to the eye, I have dyed with them in compariſon with roots which I took up on purpoſe, and I have not found any difference in the liquor, or in the brightneſs and fixation of the colour.

"The huſbandman may therefore, in caſe of need, keep his crop of madder a year in a hole made in his farm-yard, or in a pit dug at the end of the field; only obſerving to lay it in alternate layers of roots and of earth. He will thus be enabled to wait till he finds a proper opportunity to ſell, and the buyer will no longer have it in his power to tyrannize over him by taking advantage of his neceſſities. The dyer, who will know his own intereſt well enough to adopt my method of dying with freſh roots, may alſo keep them equally well in the ſame manner, in a hole in his cellar, from whence he will take, whenever he pleaſes, whatever quantity of them he has occaſion to uſe.

"It may not be amiſs to repeat here, that when theſe roots are uſed freſh they need only be waſhed a little to clear them of earth, and that the quantity of them put into the dye ſhould be after the rate of four pounds for each pound of ground madder which the operation would require. Theſe roots are cut into middle-ſized pieces, and pounded in mortars of ſtone or wood (iron abſolutely excepted) till they are reduced into a kind of pummice, and this is thrown into the copper when the water (of which I have experienced that, in large works it is hurtful afterwards to increaſe the quantity) is a little more than lukewarm. The liquor is then heated to a degree at which a man can hardly bear to hold his hand in it, and whilſt it is in this ſtate the ſtuff or cotton is puſhed down into it, and there worked about during three quarters of an hour, between hot and boiling, after which the liquor is made to boil during three quarters of an hour more.

"As this liquor remains, after the dying is finiſhed, much finer than that which has been made with the Dutch ground madder, I intend this winter to try whether it may not be put to ſome farther uſes; and I ſhall, in due time, give an account of whatever I may ſucceed in."

M. Duhamel thinks the month of September the moſt proper time for cutting the ſtems of madder, in order to their being made into hay. The Flemings cut theirs in Auguſt: but that is when they do not intend to ſave the ſeed, of which indeed their madder yields but little, as was before obſerved. As Mr. Ray informs us that the madder which grows wild in England preſerves its verdure all the winter, it will become a conſiderable addition to our winter and ſpring ſucculent food for cattle, and this will add greatly to its value; for this plant has been experienced to be an excellent fodder for cattle.

Cows fed with the tops of madder yield plenty of milk, which is a little tinged with red; and the butter of it is yellow and well taſted.

After the madder has been cut for hay, the ground ſhould be gently ſtirred, eſpecially in the alleys, and particularly if theſe are to be planted with madder the next year.

When the ſame ground is to be planted anew with madder, the whole of it ſhould be thoroughly ploughed after all the roots are taken up, and the beds ſhould now be made where the alleys were before. If the ground is ſown with wheat after this ſecond crop of madder has been taken up, the farmer may reaſonably expect an abundant crop of corn: for beſides that madder does not impoveriſh the ground; the weedings and frequent ſtirrings neceſſary for the culture of this plant prepare it well for wheat or any other crop. M. Duhamel confirms this by the following experiments.

A field of madder being dug up, he ſowed it with ſpelt, which was harrowed in, and did not appear for ſix weeks, becauſe the ground was very dry; and even after this, only a ſmall quantity of it ſprouted: yet, at harveſt, this field yielded as many ſheaves as others in the ſame country; but with this eſſential difference, that the ſtraw of theſe was ſix feet long inſtead of four, and the ears were as long again as thoſe in the other fields.

Another year, having ſown ſpring-wheat after a crop of madder, there were, at harveſt, twenty dozen of ſheaves on an arpent (about an acre and one fifth) whilſt the other fields yielded but eight or nine. Likewiſe, another year again, having ſown oats on a piece of ground where the madder had juſt been dug up, it yielded forty dozen of ſheaves to the arpent. The common lands produced that year but five or ſix dozen.

The peasants about Lisle, being in too great a hurry to enjoy the fruits of their labour, take up their madder before its roots have attained a proper size. The Zealanders let their's grow larger. A medium should however be observed; for the roots which have remained long in the ground yield less dye than those which have stood only till they have acquired the bigness peculiar to each kind.

This root, which is one of the best ingredients that can be used for dying wools and stuffs, gives them a red colour, not very bright, it is true; but which resists, without alteration, the influence of the air, the heat of the sun, and the effects of the ingredients made use of to try colours: it contributes also to make other mixed colours lasting: finally, a method is found out of giving cotton a very pleasing and lasting carnation colour with it. All parts of the root do not yield this red; the dye of some parts fades, other parts are worth nothing at all.

In examining a well-conditioned root of madder with a microscope, under the outer bark, in the flesh may be perceived certain red particles, which certainly yield the colour which the root contains; but there is, besides this, seen a great quantity of woody substance of a fallow colour; and this substance probably impairs the first mentioned colour. According to M. de Tourniere, this fallow colour is not so good a shade as the red; and he imagines that leys, &c. give a brightness to the colours dyed with madder in no other respect than by abstracting this fallow colour. The sun and dews have the same effect on yarn dyed with madder, when it is exposed on the grass.

M. de Tourniere also imagines, that the part which yields the red, is, in the green root, dissolved in a mucilaginous juice; for the bark, and the other parts which contain most red, are also most succulent: by drying them in a kiln they lose seven eighths of their weight, and yet the roots are not perfectly dry; for they bend before they break; they are rather bruised than ground by the mill; and this unctuous powder is apt to clot: it is true, that in time they lose this unctuousness, and become dry; but at the same time the quality of the red particles is lowered. These observations are well deserving of attention; for they make it evident to us, that these valuable particles may be impaired by too great a heat: supposing it unctuous, were it too much dried, perhaps water would not dissolve and separate its parts. Finally, these reflections of M. de Tourniere agree very well with the experiments of M. d'Ambournay, and convince us that madder-roots may be used green with very considerable advantage. But green madder can never be used, except when the grounds lie convenient for the dyers: thus, when madder is to be carried to any considerable distance, it must of course be dried, and pulverized. I shall resume this subject.

1. As madder-roots are very apt to ferment when they are bought green, it will be necessary to examine carefully whether they are spotted, or have a musty smell: if the fermentation has given them a black hue, they are by all means to be rejected.

2. The roots to yield a fine dye should be fresh: such as are dusty on being broke must therefore be rejected, and with still greater reason those that are rotten and worm-eaten: on the contrary, such ought to be preferred as have a strong smell somewhat like that of liquorice: the ground-madder should be unctuous, and run into clots on being handled.

3. As madder is sold by weight, it is an advantage to the purchaser to have the roots quite dry; but he should be careful that they have not been kiln-burnt: such as have a strong smell have seldom this defect. Too hasty a drying wrinkles and splits the bark; and, as it then separates very easily from the wood, the most useful part is lost: the bark therefore should be smooth, entire, and adhering to the wood: but we must not confound the true bark with the outer bark, or epidermis, which would only lessen the brightness of the colour.

4. The largest roots are not always the best: they are frequently yellow, and have but little of that red which alone yields the colour. The very small roots are of little value, as they have too much outer bark, which hurts the colour: but those of the best quality are from the size of a goose-quill to that of the end of the little finger.

5. In breaking the roots there may be seen, as I have already observed, two substances differing one from the other: that which inclines to a yellow only, hurts the dye: that of the deep red is the part really useful; consequently the highest coloured roots should be preferred.

It would be a useful discovery could there be a method found out of extracting the red particles without any mixture with the fallow or yellow part: I am of opinion the trials should be made on the green root, that the red particles, which are then in a state of dissolution, may be more easily extracted.

6. As the surest method of knowing the quality of madder is to make a trial of it on some piece of stuff, it will not be amiss if such as plant much of it accustom themselves to make this trial, that they may demonstrate to the purchasers the quality of their roots: the following process for doing it, is extracted from the works of M. Hellot.

To dye a pound of woollen-yarn, a bath must be made with five ounces of allum, and one ounce of red tartar, dissolved in a sufficient quantity of water: the wool that is to be dyed must be well drenched in this liquor: in about a week half a pound of ground madder root is to be thrown into water as hot as you can bear your hand in; and, after having mixed the water and powder together with a stick, the wool is put into it; and the bath must be kept hot for an hour, but not boil; for, if it did, the colour would be dull: but towards the end of the time the bath is made to boil; but the yarn must be instantly taken out.

As very trifling circumstances will affect the beauty of the colour, it will not be amiss to make at the same time two trials with the same yarn; one with the madder that is to be proved, and the other with the fine madder of Zealand, or azala: the beauty of the skains will determine which is the best madder.

As these trials may as well be made on two or four ounces of yarn as a pound, the baths may be made accordingly. I shall now treat of the methods of drying and pulverizing madder.

We have observed that green roots are very apt to ferment: it is therefore necessary to abstract the great quantity of moisture that causes it. If the weather is very dry and hot, it is certainly advisable to take the advantage of it to dry the roots in part, and save wood; but, if the weather is damp, the roots must be spread under sheds, or on barn-floors, and often moved; for, if they were laid in heaps, they would soon heat, and change, more or less, according to the state of fermentation they were in. With care the fermentation of the roots may be greatly lessened; and, according to M. d'Ambournay's opinion, they may even be kept good for some time; but the roots cannot by these means be made dry enough to preserve them from any change. For small crops a common oven will serve; but it must not be heated to above forty-five or fifty degrees of M. de Reaumur's thermometer. But this method is very tedious, and it would require very large ovens to supply the place of kilns. To save the expence of building a kiln, I would recommend the making a place over the roof of the oven, to put the roots in, that they may begin to dry: but, if we grow much madder, it is absolutely necessary to have a kiln proportioned to the quantity that is to be dried, not only of our own crops, but those of the peasants that cannot afford kilns.

The kilns may be made of very different forms, many of which are of equal goodness; but when a man proposes building one, he should be attentive, 1. That it may contain a large quantity of roots: 2. That it may be worked with ease: 3. That as little fuel as possible may be used: 4. And that it be so contrived as to retain an equal and moderate heat. To make these matters easy to planters, we shall describe the kilns that have been long in use at Lisle for drying madder-roots: we shall point out their defects, as well as the defects of two kilns that were successively built at Corbeil; and, lastly, we shall mention the attempts we have made to improve and perfect them.

Description of the Lisle Kiln.

This kiln differs very little from that used for drying malt. To have a general idea of it, we must suppose there is

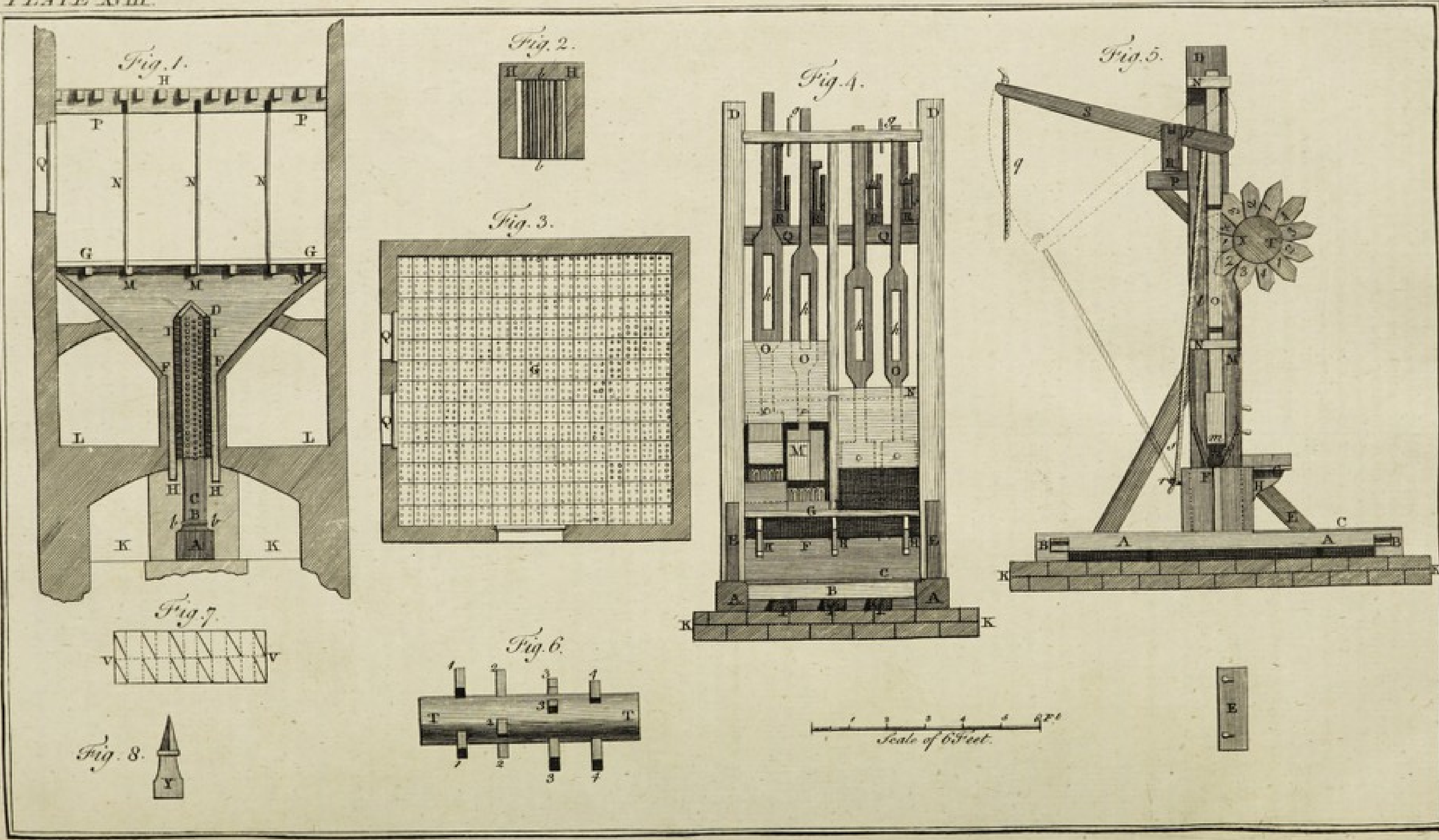


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Scale of 6 Feet.

is a large furnace, in which a great fire is made: this furnace is made under an arch: the hot air and fmoke pafs through a funnel over the furnace, and fpread themfelves in a fpace in form of an inverted pyramid, the bottom of which is covered with a perforated floor, on which the madder-roots are fpread. This is the general form of the kiln; but we fhall give a defcription of it according to the figures in the plate, for the ufe of fuch as intend to build one.

The Fig. 1. Plate XVIII. reprefents the fection of a building, containing a madder-kiln.

In this building may be feen a vault, K, K, a ground-floor, L, L, and a firft floor, G, G, over which we are to fuppofe a granery, H. The foundation of the brick-work of the kiln, is fomewhat lower than the bottom of the vault; the walls terminate in arches, at the bottom of the firft ftory; the fide-walls of the building ferve as upright fupporters; and the arches of the kiln are fuftained by jams, which are put into the fide-walls. All this will be better underftood by explaining the letters of reference.

A, an afh-hole two feet wide, three feet and a half deep, and two feet three inches high. B, the furnace with an iron grating, *b b*, at bottom. C, a pricked line, which determines the height of the furnace door: this aperture is fixteen inches wide, and feventeen high. D, the chimney, B, the perforated funnel, which difperfes the heat, by means of the holes, *i i i*. It is to be obferved, that this chimney is entirely covered at the top, to prevent any thing falling into it. I I I, holes two inches fquare, by which the heat efcapes; they are placed chequerwife. F, an empty fpace, into which the heat goes, out of the funnel before it reaches the upper ftory. G G, a floor fet with fquare tiles, on which the roots are to be fpread one foot and a half thick. Thefe tiles are fifteen inches long, ten or eleven wide, and two thick; they are perforated with conic holes, as here reprefented. H H, tubes four inches wide, by which the fuperfluous fmoke efcapes, and through which fall the dufky particles that drop through the holes in the tiles of the floor G. Thefe tubes are ftopped by a little iron door, which is opened when the heat is too great.

K, the vault in which the fuel is kept. L places where the undried madder is fafely kept. M, iron joifts two inches thick, traverfed by bars which bear the tiles that compofe the floor. N, iron braces fixed to the beam P, to fupport the floor G. P, the beam of the fecond ftory. Q, a cafement or window, to be opened at the beginning of every drying, to let out the fmoke. When the madder begins to dry, thefe cafements are fhut, to keep in the heat. There are alfo in the fecond flooring two trap-doors, which are open to let out the fmoke and fteam.

Fig. 2. reprefents the plan of the furnace. The three iron bars which crofs it, are each two inches and a half broad, and fix lines thick; they are let into the wall three inches; the bars of the grating are one inch fquare, and rivetted to the other bars. In this plan are to be feen the tubes marked H, to fhew that they run the whole depth of the furnace. Thefe tubes are very neceffary to convey into the kiln the heat from the body of the furnace.

Fig. 3. reprefents the plan of the tiled floor, G: it is fixteen feet fquare.

As the furnace we have defcribed refembles that ufed for drying malt, we was willing to obferve in what manner it was dried, and remarked, that they lay it about nine inches thick, and that it is very hot at bottom. When M. de Reaumur's thermometer was applied, it rofe upwards of twenty-two degrees above Zero; but the upper part, being influenced by the external air, heats but little: the fteam that rifes, being condenfed by the cool air, is reduced to water, which occafions the upper part of the bed of malt to be always wet: for this reafon it muft be often turned. In this method, by being often wetted with the fteam, the bed of malt is much retarded in its drying. We imagined this inconvenience might be removed, by preventing the external air from affecting the furface of the bed: and this would be affected by making a covering for it; and, if this covering could be fixed within a foot of the malt, another advantage, which we fhall mention, would refult.

It is well known in phyfics, that the vapours which arife from heated matter, have a great power of penetrating and heating the matter whence they proceeded, provided they are collected, and in fome manner reverberated on the matter to be heated: it is on this principle the machine was conftructed in which the bones of animals could be diffolved; and we know, that in an equal degree of heat, water has eight hundred times more volatility than air; and vapours or fteam contain a great deal of water.

This induced us to think, that it would be of great ufe to reverberate the fteam on malt and madder-roots, by means of the covering above mentioned. M. Villot, a brewer at Paris, who takes all opportunities of improving his beer, has made fome experiments of this nature, and in part fucceeded. It is only neceffary then to contrive a method of putting this in execution in a large building, of which we fhall in due time take notice.

One great defect of the Lifle kiln is, that the fmoke, mixing with the roots, charges them with fuliginous matter, which probably hurts the colour, and is perhaps the caufe of the difference betwixt the Levant madder and that of Lifle, thefe laft being by no means fit for dyeing cotton, as done in the Levant: befides, in thefe kilns the workman cannot properly regulate his fire: thefe defects might be removed by making the middle clofe, and terminating it in a tube of caft or hammered iron, to carry off the fmoke: the floor, fupported by iron bars, might very well be difpenfed with, and inftead of it one of wood, lattice, wicker-work, or iron wire, would do; for the funnel once properly fecured, there would be no danger of fire. In order to enable every one to vary the conftruction of thefe kilns, we fhall add fome reflections and obfervations made with great care by M. de la Levrie, who fuperintended the building of two kilns at Corbeil.

Remarks on the Kiln ufed at Lifle.

It will not be amifs to begin by relating the experiments made with two kilns, built one after the other at Corbeil, to dry madder, as thereby the advantages of that, herein after propofed, will be more evident.

The firft of thefe kilns was twenty-one feet long, twelve wide, and ten feet high: within-fide it was furrounded by three ftages of hurdles, like fhelves, four feet wide, and twenty inches one from the other: the firft ftage was five feet from the ground: on thefe ftages the green madder was laid eight inches thick. In the upper floor was a trap-door, which opened to let out the fteam of the root. The furnace, which was not without defect, went three feet within the kiln: it was fupplied with fuel from without: within-fide it was furnifhed with metal tubes, which paffed through the fire: thefe tubes received at one end the outward air, which they difcharged within, very hot, by an aperture two feet from the ground. The effect produced from this kiln was as follows: the three ftages, being filled with roots, thofe on the upper ftage became dry enough to fend to the mill. It is true, they dried but flowly, becaufe the fteam, which proceeded, though in no great quantity, from the two lower ftages, wetted the under part of the hurdles of the firft ftage, thereby retarding the work. The heat which was not powerful enough to raife all the moifture of the madder-root on the lower ftages in fteam, made them fweat abundantly, fo that the under parts of the hurdles were covered with drops of water as big as the finger's end, which fell from the fecond fhelf on the firft, where they wetted the root; and from the firft fhelf they fell to the ground. On the upper fhelf were very few of thefe drops of water, except for a very fmall fpace of time after the kiln had frefh roots put into it, becaufe at the upper part of the kiln the heat was powerful, and regularly difperfed, whilft at the bottom it was cold. At each ftage was fixed one of M. de Reaumur's thermometers: after four days continual fire the loweft fcarcely rofe to eighteen degrees; the fecond, fomewhat higher; and the uppermoft never paffed eighteen degrees, which is thought fufficient, when the drying is not retarded by any fteam from below. When the dried root was carried to the mill, the root from the fecond ftage, which had loft part of its moifture, was removed to the third, and that of the firft ftage ſtage, ſtill wet, was laid on the ſecond, the firſt ſtage being filled with freſh roots. The loweſt thermometer then fell to fourteen degrees, and the uppermoſt to Zero: this induced them to dry all the roots that were at once put into the kiln, before they admitted any freſh; yet even in this method it was neceſſary to move the roots from the lower to the upper ſtages, where the laſt laying dried faſter than the others. As this work was tedious and troubleſome, it was determined to take down this kiln, and build a new one, now in uſe.

This ſecond kiln is of the ſame length and breadth as the firſt; but the hurdles on which the madder is put are raiſed only ſix feet from the ground, and the apertures of the furnace, which ſupply the hot air, are level with the ground: they, beſides, continued to avail themſelves of the miſtaken advantage of encreaſing the ſurface to contain more roots, by making, as in the firſt, three ſtages of ſhelves. The roots indeed dry in it faſter, becauſe the furnace yields more heat; but this heat is very unequally diſperſed at the different heights, and in the different parts of the length of the kiln; becauſe the ſame inconveniencies ſtill ſubſiſt, as they have made in it, like the other, three ſtages, one above the other, and they have formed the kiln long, without letting the furnace extend through its whole length. They have beſides placed the firſt ſtage too near the fire; but this may be remedied by taking it entirely away, and uſing only the uppermoſt ſtage, which is fifteen feet from the bottom of the kiln, and may extend over the whole of it: the heat will then be more regularly diſperſed. The roots may be laid fifteen or eighteen inches thick, and may be much eaſier attended to than on the ſhelves, which occaſion a great deal of trouble: there might alſo be two furnaces, one at each end of the kiln, and the tubes might be carried over the whole length of it.

From what has been ſaid, we may conclude, that to dry a plant like this, which contains a great deal of moiſture, no advantage can reſult from having a kiln with three ſtages, one hurting the other; ſince the heat tending always upwards, the roots muſt be moved higher, which cannot be done without trouble, loſs of time, and expence; whereas, the ſame quantity may be dried in leſs time on a floor raiſed eighteen or twenty feet above the furnace.

It is certain that a peaſant, who raiſes madder after a proper method, will always be a greater gainer than ſuch as are obliged to hire day-labourers. But the peaſant cannot go to the expence either of a kiln, or a mill: it muſt be planters who raiſe large quantities of it, and can afford the expence, that have them: thus, it is to be preſumed, the peaſants will be under a neceſſity either of ſelling their roots green to the dyers, of taking them up in the ſpring to dry them in the ſun, of drying them in their ovens, when they have only a ſmall quantity; or, finally, of carrying their roots to the kiln, as they do their grapes to the preſs.

The Liſle kiln, though built on a good principle, is too expenſive for a young planter. There muſt be ſtrong walls to ſupport the arches, internal abutments, and bricks to build the arches with. In ſome provinces there is not a workman capable of turning an arch in brick-work. The floor requires many large iron-bars. On the other hand, a kiln in the form of an oblong ſquare, like that at Corbeil, will never heat equally in its whole extent, unleſs tubes be made to convey the ſmoke through various parts of the kiln, before it reaches the chimney, or there is a furnace at each end. All this is expenſive, and ſubject to inconveniencies.

Perhaps then a kiln ſomewhat reſembling a malt-kiln would do; and this might any where be built at a ſmall expence: ſuch a kiln need not be above eighteen feet ſquare, and eighteen or twenty feet high from the ground to the floor. Underneath the floor ſhould be a reverſed pyramid, ſomewhat obtuſe at bottom, to receive the funnel and tubes that are to give the ſupply of hot air: this may be made with quarter-ſtuff covered with lath and plaiſter. This kiln does not require any large furnace. The new kiln at Corbeil is much larger, taken from the ſecond ſtage to the bottom; yet has the heat been brought there to upwards of forty-five degrees. The floor of the kiln is to be made with joiſts eight inches by four, covered with laths, grating, or with hurdles as at Corbeil, where it has already laſted ſeven or eight years: there muſt be walls to ſupport the roof and beams, and it ſhould have two windows: there ſhould be a plaiſter-floor eight or nine feet above the grating, with one or more trap-doors, as they let out the ſteam much better than the windows: laſtly, the beams ſhould be plaiſtered. There is reaſon to think that ſuch a kiln would coſt little, and anſwer the intended purpoſe. It ſhould have been obſerved, that over the grated floor ſhould be laid a large thin cloth, or rather a hair-cloth, riſing round the edges, and faſtened with nails: this is particularly uſeful when ſmall roots are dried, as it prevents their falling through. A foot above the roots may be put wooden traverſes, over which may be laid ſtraw-mats quilted on cloth: this will keep down the ſteam, and may be of great ſervice, as has been already obſerved.

The Furnace of this Kiln.

The furnaces of the Liſle and Zealand kilns are certainly neither of them proper for drying madder, any more than thoſe of the malt-kilns: they have all the ſame defect, as they fill the kiln with ſmoke, which damages the roots. It was this inconvenience induced us to endeavour to contrive one that would give a great deal of heat, without the above defect. This may be probably effected, by not letting the funnel be perforated, and carrying tubes from it which ſhould run under the madder before the ſmoke was diſcharged; and by having other tubes run near the fire, to circulate in the kiln a warm air, which they ſhould receive from without. We have made the trial of ſuch a furnace, and confeſs it did not yield ſufficient heat: the furnace ſhould certainly have been made larger; but the expence is a continual objection, which, beſides being conſiderable, is pure loſs to one that makes experiments for the public good, without being in a ſituation of reaping any profit from them. We ſhall cloſe then what we have to ſay on madder-kilns, by concluding, that malt-kilns ſeem well adapted to the purpoſe; but ſome method muſt be found to prevent the ſmoke damaging the roots.

Madder well dried and cleaned may be ſold in that ſtate to the dyers; but if it is to be pulverized, there will be occaſion for a mill, which we ſhall now deſcribe.

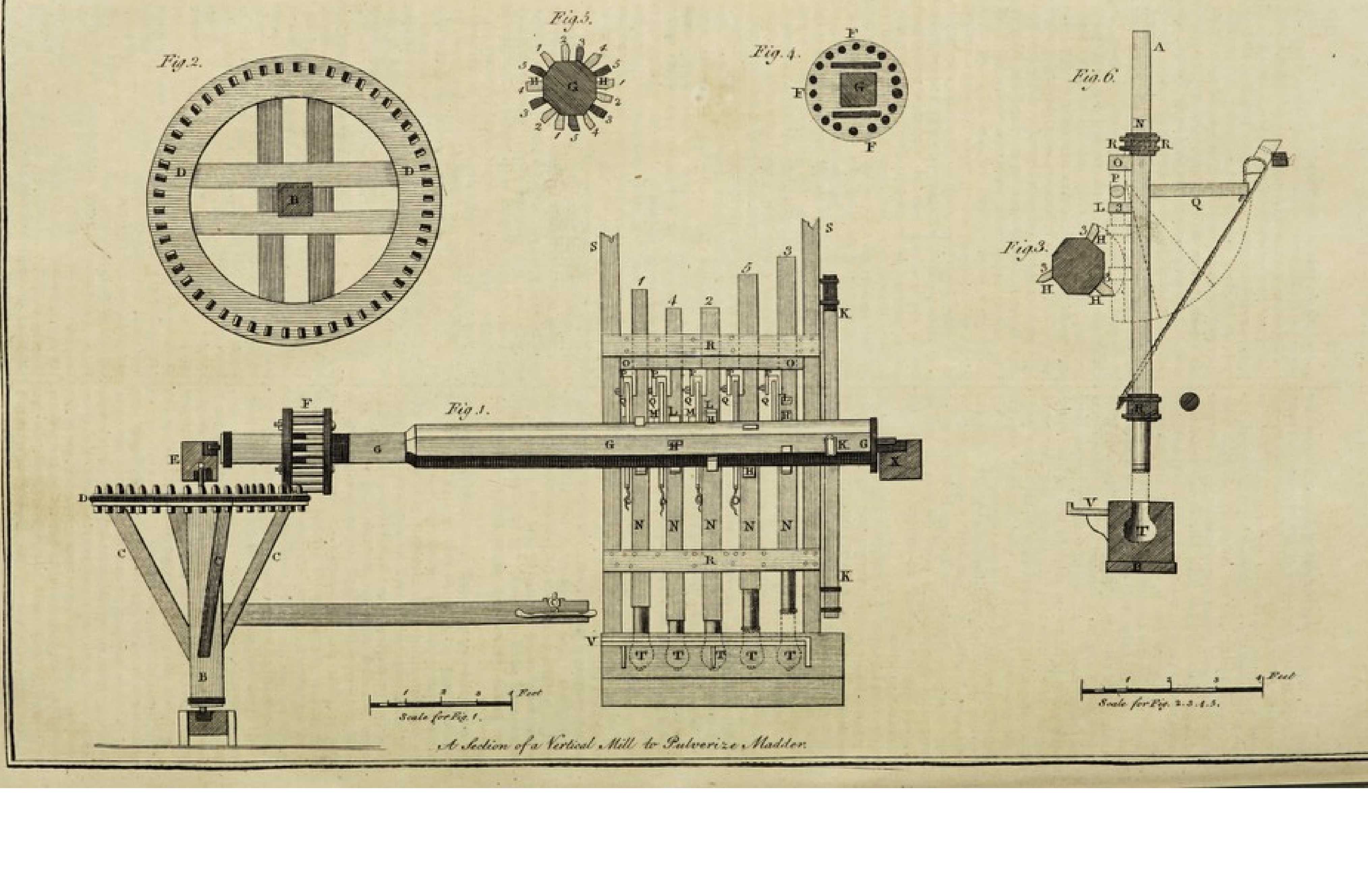
Deſcription of a Mill, at Liſle *in* Flanders, *for pulverizing Madder.*

Plate XIX. Fig. 1. repreſents the parts of a madder mill: it is inſulated, and covered only by a ſlight thatch. The figures 2, 3, 4, 5, and 6, are ſupplementary to the firſt: we muſt have recourſe to them in our explanation of the parts of the mill: they are therefore diſtinguiſhed by the ſame letters, and each piece is repreſented apart.

A is a lever, or pole, nine feet eight inches long, and ſix inches by four in magnitude. B, the axis of the wheel, ſix feet four inches ſix lines high, and nine or ten inches diameter. C, ſtays, or knees, four feet ſix inches long, and four or five inches ſquare. D, the cogged wheel, three feet one inch ſix lines ſemi-diameter, and furniſhed with fifty-ſeven cogs.

The fellies, or circumference of this wheel, muſt be eight inches by four large: they are ſecured by an iron hoop. The traverſes are ſix inches by four thick, pinned and keyed. The cogs are made of apple-tree wood, and project three inches three lines: they are two inches and a half by two, at their inſertion, and two inches and a half by one at the top: and beneath the wheel they are two inches long, and one and a half ſquare: they act on the rounds of the trundle-head about one inch and a half of their length. The pins that faſten them are alſo apple-tree wood.

E is a beam twelve inches ſquare. F, the trundle-head, thirteen inches ſemi-diameter, furniſhed with eighteen rounds, each a foot long, and two inches diameter: the ends of this trundle-head are two inches and a half



A Section of a Vertical Mill to Pulverize Madder.

half thick, and hooped with iron. There are alfo two iron bars pinned on to fecure the joints of the wood.

G is another axle-tree, or turning-beam, eighteen feet fix inches fix lines long, ten inches fquare near the trundle-head, and fourteen inches diameter in its octogonal part. H, lifters four inches nine lines long, five inches broad, two inches and a half thick. Hence it is apparent, that there are fifteen lifters inferted into the axle-tree, to ferve five beetles; that is, three to each. For this reafon the lifters, the catches, and the peftles, are diftinguifhed by the fame figure.

K, flyers four feet five inches long, and four inches fquare: they are loaded with lead at their ends. L, catches, which anfwer to the lifters, H: they project five inches nine lines, and are five inches broad and two and a half thick.

M, other catches inferted into the fides, or thicknefs of the beetles, N, and anfwer to the levers. Q, N, beetles ten feet four inches long, and four inches fquare. They are round at the end next the mortars, and fhod with an iron foot four inches diameter, which may be feen in figure 6. The beetles are numbered in this manner, 1, 4, 2, 5, 3, (Fig. 1.) to fhew the order in which they play when the machine is in motion. O, crofs-bars fix inches by four, which fupport the joints, P.

P, joints eight inches long, fix wide and four thick. An iron pin, keyed, paffes through each joint, and fupports a moveable lever, Q, which acts on the catch, M, when the peftle, N, is to be kept up. Q, levers, two feet three inches fix lines long, three inches thick, by four wide.

R, keeps, fix or eight inches wide to prevent the beetles from being difordered. S, an upright poft four inches fquare, in which the crofs-bars and keeps are inferted. T, mortars cut in a fingle piece of wood fixteen inches fquare: they are eleven inches deep, and their greateft diameter is feven inches: the bottom is lined with lead three or four lines thick.

V, a trough to prevent wafte, over which hangs a cloth, faftened above to the keep, whilft the mill is at work.

X, a beam twelve inches fquare; this beam, and that at the other end, marked E, reft on the timber work that fupports the roof. The fockets and pivots may be fo well comprehended by the plate, that letters of reference were thought unneceffary: the fockets are brafs, the pivots fteel.

We have purpofely omitted giving the dimenfions of every part, to avoid confufion; but the machine may be eafily conftructed by attending to the defcription we have given, which is very exact.

But though the mill defcribed above, is now actually employed in grinding or pulverizing madder at Lifle; yet it labours under feveral imperfections, which we fhall endeavour to point out, and defcribe a mill conftructed in a more perfect manner.

There will be, however, no occafion to defcribe the wheel work of this mill, it being the fame as that of Lifle: it will be fufficient to give the proportion of the parts which compofe it. The pole, or lever, from the center of the axis of the cogged wheel, to the part where the links of the fpring-tree bar are faftened, is nine feet long; the wheel is five feet femi-diameter, and has feventy-two cogs; the trundle-head is ten inches femi-diameter to the center of the rounds, and has twelve rounds; thus it makes fix turns to one of the wheel. The horfe, going three feet in a fecond, makes three rounds and a half in a minute, and the trundle-head twenty. The axle-tree having on its circumference three lifters to every beetle, each beetle makes fix ftrokes in a minute, and the four two hundred and forty in the fame fpace. The fquare part of the axle-tree, on which the trundle-head is fixed, is made out of a piece of wood five inches femi-diameter; the other part of the axle-tree is larger, being feven inches femi-diameter. It is neceffary it fhould be fo large, that the tenons of the lifters may have a proper length and thicknefs: it is much better to be round than an octagon, or any other faced form, as the mortifes may be more regularly made. From the end of the lifters to the center of the axle-tree is twelve inches; fo that in their motion they form a circle two feet diameter: the upper face of thefe lifters is cut in a curve, the radii of which are tangents to the circumference of the above-mentioned circle; the largeft of thefe tangents is twelve inches, and determines the greateft rife of the beetles. By the lifters being thus curved, the refiftance is equal, at whatever height the beetles may be, as they are always in contact with the lifters at the fame diftance from their center of gravity. As there are on the length of the axle-tree twelve lifters in four parts, they form, one with the other, angles of thirty degrees, fuppofing them to be feen one behind the other, as if inferted on the fame plane: on this account, when the firft beetle is raifed to half its height, the fecond is about to rife; the firft quitting the lifter, the third is on the point of rifing, &c. We fay, on the point, becaufe we are to obferve, that the lifters go under the catches, or under that which fupplies their place, five or fix lines; and that the greateft tangent of the curve, being twelve inches, is lefs, by near feven lines, than the fixth part of the circumference of the circle, and gives the firft beetle time to quit the lifter before the third rifes: this is neceffary, that the power may never have more than two beetles to act upon.

The front of the frame-work is that fide before which the axle-tree turns. The frame-work confifts of two beams, ten feet long, and eight inches fquare: betwixt them, at each end, is a traverfe quarter, fix inches by four. In the middle of the length and width of the beams, rife two uprights, which are mortifed and pinned: they are twelve feet eight inches high without their tenons, fourteen inches wide, and fix inches thick, fupported by a brace mortifed into the front at the height of two feet, at the back part four feet and a half. Betwixt thefe two uprights is the block on which the beetles fall: it is made of a piece of dry tough elm, four feet and a half long betwixt the uprights, to which it is joined by a dove-tail two inches thick, and as much deep: it is twenty inches high, and eighteen broad: it refts the whole breadth of its ends on the edge of the beams, and betwixt them, on three pieces of wood, at equal diftances, that lie on the brick-work, which fupports the whole. The block is divided crofs-ways, by a partition two inches thick, parallel with the uprights, and of the fame breadth, fixed into the block by two tenons, and in a groove wide enough to receive its whole thicknefs; the fame is obferved in the back part of the firft keep, which is fixed: the upper end is, in like manner, fixed to the upper-keep: this partition divides the block crofs-ways into two troughs, each twenty inches long, formed by two floping planks; fo that the troughs are four inches and a half wide at the bottom within, eleven inches and a half at the top, and twelve inches perpendicularly high: and to prevent the lofs of the light duft that rifes in the work, the fpace betwixt the edge of the troughs, and the firft keep, is boarded up; the boards at the back-part, as well as the fides of the troughs there, are faftened with grooves and dove-tails into the uprights and partition; thofe before lift up in a groove like a fafh, and are faftened by turn-buckles; the fronts of the troughs take entirely off; the pulverized root is taken out with a wooden fpoon, and a feather broom, and they let it fall on a fhelf before, which has a ledge four inches high: the fronts of the troughs are then put on again, and are filled with branch-madder; the fliding-fhutters are pulled down, and the peftles are fet at liberty to work, which had before been ftopped whilft the troughs were emptied; this takes but little time in doing; and the mill continues going during the time they gather up the root, and bolt or fift it. There are two keeps, which ferve to direct the beetles: the under part of the firft is three feet, and the under part of the fecond ten feet: above the block they are three inches and a half thick; the firft is made level in the front with the back of the groove, that the fliding fhutters may reft on it when they are raifed. Each keep confifts of two parts; thofe at the back are let into the uprights, and pinned to them, and ftrongly faftened to the partition: thofe in the front are made to take down, and put up, as occafion ferves; they flide in the grooves of the uprights, and thofe that run along the middle of the partition: they have, befides, two pins, by which they are kept in their places.

The beetles are, at the lower part, twelve inches wide, eighteen inches high, and four inches thick; so that their face, or bottom, contains forty-eight square inches: the upper part, or stock of each pestle, is eight feet and a half long, four inches wide, and three thick; so that in the whole, they are ten feet long, without comprising the cutters, which are four inches long, and formed like a carpenter's chissel: the blades of them are two inches and a half wide, and the tongues three inches and a half long: there are seventeen to each beetle. There are no catches, because the lifters being in contact with their extremity, always at the same distance, five inches from the center of gravity of the beetles, the resistance occasioned by the friction of the stocks in the keeps, would have been very considerable. To avoid this inconvenience, a mortise twenty-five inches long, and three inches wide, is made in the face of the stocks of the pestles, strengthened on the sides by cheeks two inches thick. The upper parts of these mortises are six feet above the block; that is, on a level with the center of the axle-tree: this part is lined with a plate of copper, strongly screwed, well polished, and rounded at the edge, to facilitate the fall of the beetles. On the side of the beetle-stock, sixteen inches below the upper keep, are fixed catches a full inch thick, two inches high, and projecting four inches, to keep the beetles up while the troughs are emptying.

The levers, which serve for this purpose, are placed behind, and rest on shoulders fixed on a piece of wood, which bears by its two ends on two brackets, mortised and pinned into the two uprights, and supported by braces: these pieces are six inches square. The levers are made of quarter-stuff, six inches and a half square, as well as the lifters of the axle-tree. The upper face of the shortest arm of the lever is rounded like the lifters, in a curve described by the original circle, the radius of which is the space from the middle of the catch to the center of motion of the lever, which should be parallel to the bottom of the catch. The radius of this circle, as well as the greatest of the curve, should be fifteen inches, that the beetle, being raised thirteen or fourteen inches, may not slip off. That the levers may be the stronger, the wood must not be cross-grained; and in the center of motion, it should be traversed by a square iron bar, projecting two inches on each side: these projections, being rounded into pivots, rest on the shoulders in brass sockets. A cord is fastened to the shortest arm, and the end of it is fastened occasionally to wooden pins at the back of the block, to keep the levers somewhat lower than the catches, whilst the beetles are at work. The longest arm lessens by degrees towards the end, till it is reduced to a square: at this part is fixed another cord, which is fastened to the same wooden pins, when the beetles are to be kept up. The above description, with figures on the copper-plate, will be sufficient for an ingenious mechanic to construct a mill of this kind, which will doubtless be of great advantage to this kingdom, as considerable quantities of madder are now planted, and some of it fit for use.

REMARKS.

The beetles of this mill weigh only one hundred pounds with their mounting; perhaps a few pounds more, which may be abstracted by taking off a few inches of the lower part: there are never more than two beetles raised at a time, and one hundred and thirty-three pounds and a half for the power to act upon. A middle-sized horse is generally reckoned able to apply one hundred and eighty pounds of his strength to move a machine, working for four hours together, and going three thousand six hundred yards in an hour: he often goes faster, but so was this mill calculated: there remains then forty-six pounds and two-thirds for the action, which is more than it amounts to in this machine: we may even venture to assert, that the friction of it is less than any other mill of the kind. A horse may bear this work the better, as every five or six minutes there are two or three minutes respite to empty the troughs, and give them a fresh supply. This mill at Corbeil never pulverized above two hundred pounds of roots a day, because that was all the kiln could supply it with; but the time in which this work was done, induces us to think it could easily pulverize four hundred and eighty, or five hundred pounds. They say that the Lisle mill can pulverize five hundred pounds in twenty hours: we scarcely believe it, especially as we imagine it does not work in the night: thus we must suppose it really works only ten hours, like that at Corbeil. Be it as it may, the work of these mills should be calculated by the weight of their beetles, the number of blows they strike in a minute, and the superficies of their bases; that is, the Corbeil mill is to that of Lisle, as four hundred pounds, the weight of the four beetles multiplied by two hundred and forty, the number of blows they strike in a minute, and the product by one hundred and ninety-two, the superficies of the bases of the four beetles, is to three hundred and eighty-five, the weight of the five beetles, multiplied by one hundred forty-two and a half, the number of blows they strike in a minute, and the product by sixty-three, the superficies of the bases of the five beetles; or, after the numbers are reduced, as sixteen is to three; by which it appears, that if the Corbeil mill pulverizes five hundred pounds in twelve hours, that of Lisle should pulverize no more than one hundred.

The indifference they discover in Flanders, with respect to the situation of the kilns and mills, is worthy of blame: they are, it is said, in separate buildings, which have no communication: nothing can be more inconvenient. It is well known at Corbeil, that the root, which they some time ago pulverized in a little hand-mill, fixed in a barn, ten or eleven yards from the kiln, which had no influence to warm it, grew damp, and clogged under the cutters, by which it was much damaged. This work is always done in winter, and it is scarcely possible it should be otherwise: the fogs must therefore be guarded against.

The kiln we have recommended would contain four thousand pounds weight of green madder, which would yield five hundred pounds of dry root when it had been there forty-eight hours: the mill can pulverize this quantity in a day. If one had a very considerable crop, for instance, four hundred thousand pounds, which would yield fifty thousand pounds of dry root, and this is as much as the mill could turn out in four winter months, working every day, it would be necessary to have two kilns. The buildings to contain the kilns and mill might be disposed nearly in the following manner. A building should be erected sixty-three feet long, and twenty-one wide, with a floor twenty or twenty-two feet from the ground, which should be a store-room for part of the green root: the under part should be occupied by the mill and its frame-work, so that at each end there would be a space of eighteen feet to the walls at the extremities: in the middle of this space the apertures of the furnaces to heat the stoves should be made, which should be so situated, that the floors of the kilns should be on a level with that of the store-room: trap-doors might be contrived in the floor of the store-room, to throw the dried roots down; and as they ought to be kept dry till they go to the mill, they may be heaped round the furnaces under the reversed pyramids of kilns; for they should be kept dry till they are barrelled up.

On a supposition that the produce of four hundred thousand pounds might be pulverized in the four winter months, some place should be provided to keep it in proper order till the last went to the kiln: it must be spread at most two feet thick, that it may every day be turned. Experience convinces us, that eight cubic feet of green root weigh one hundred pounds. The surface of the granary will give one thousand three hundred and twenty-three square feet, which, divided by four, give three hundred and thirty quintals and a quarter, or thirty-three thousand seventy-five pounds; but this does not come near four hundred thousand pounds. It is presumed, the best way would be to erect some large building, four or five stories high, which might altogether contain, at least, twelve times as much as the store-room above-mentioned; but this expence might be saved, if the root could be taken up in small quantities during the autumn, winter, and part of the spring.

Explanation of the Figures of the Corbeil *Mill.*

Fig. 4. Plate XVIII. is the frame-work of the mill seen in the front: Fig. 3. is the same frame-work seen endwise, the upright and beam being taken off.

A,

A, beams, eight inches ſquare, ſeen end-wiſe (Fig. 4.) and the length of one of them, which is ten feet (Fig. 5.)

B, traverſe quarters, which are fixed into the beams: the length of one of them is ſeen (Fig. 4.) and the ends of both are ſeen (Fig. 5.) they are ſix inches by four.

C, a flooring or ſtage, laid on the grooved edge of the beams, and the traverſe quarter.

D, uprights, fixed to the beams: their thickneſs may be ſeen (Fig. 4.) the top of one of the uprights only is perceivable (Fig. 5.) over the upper keep, N; and the breadth of the bottom is diſtinguiſhed by two pricked lines on the end of the block which covers it, as the remainder of it is concealed by the middle partition. Theſe uprights are twelve feet eight inches high, ſix inches thick, fourteen inches broad, as high as the axle-tree, then reduced to ten inches.

E, braces, which keep the uprights ſteady on the beams; thoſe in the front are mortiſed at the height of two feet, thoſe behind at four and a half: they are ſix inches by four.

F, the block, on which the beetles fall: it is made of elm, four feet and a half long betwixt the uprights, and twenty inches high by eighteen broad: it has at each end a dove-tail two inches thick, and as much deep, which goes into the grooves of the uprights.

G, a ſhelf, level with the upper part of the block, of the ſame length, twelve inches wide, two inches thick, and a ledge four inches high: it reſts on a groove at the edge of the block, and on the brackets H, Fig. 4 and 5.

I, three pieces of wood, which ſupport the block.

K, the brick-work, which is the foundation of the frame-work.

L, a partition which divides the block into two parts: it reaches from the block to the upper keep; it is two inches thick, and the ſame breadth and ſhape as the uprights: it has on the front, and two ſides next the uprights, grooves which run up till it begins to narrow; there are other ſimilar grooves in the uprights. This partition conſiſts of two parts: the lower part is fixed in a groove of the block, and above with a tenon, and is beſides pinned to the back part of the firſt keep, which is fixed: the upper part is tenoned into the upper part of the firſt keep, and the under part of the ſecond: they go into grooves that croſs the whole breadth of the front parts of the keeps, which are moveable.

M, troughs in which the roots are kept: they are four inches and a half wide at bottom, eleven inches and a half at top, and twelve inches perpendicularly: they conſiſt of two boards ſloping before and behind (Fig. 5.) the ſpace between their edges and the firſt keep is boarded up. In the front *d*, are ſliding ſhutters. The fronts of the troughs take off. In Fig. 4. is ſeen one of the troughs open, and the ſliding ſhutter puſhed up: two of the beetles are alſo viſible, one quite, the other half raiſed.

N, are keeps, three inches and a half: their breadth conſiſts of two parts: thoſe behind are entirely fixed to the uprights: they are ſeven inches broad, notched half the thickneſs of the ſtocks of the beetles, in the parts where they paſs: the other two pieces take off at pleaſure, and are notched in the ſame manner to give the beetles room to work: they have each of them two keys, or tongues, four inches broad, four long, and one thick, which go into the mortiſes in the fixed part of the keep, between the ſtocks of the two beetles belonging to each trough, where they are faſtened by two large pins, *g*. They ſlide on the grooves of the uprights: the undermoſt is ſix inches broad, that the ſhutters may ſlide over it: the uppermoſt is four inches, conſequently projects an inch: the edges are rounded off. The under part of the firſt keep is three feet above the block; the under part of the ſecond, ten feet.

O, beetles, ten feet high: they are twelve inches broad at bottom, to the hight of eighteen inches (Fig. 4.) four inches thick (Fig. 5.) with a ſtock eight inches and a half long, and four inches broad, by three thick. At an inch above the firſt keep, they are left ſeven inches broad, for thirty-ſeven or thirty-eight inches, to make room for a large mortiſe, *b*, twenty-four inches long, and three inches wide. The upper part of the mortiſe is lined with copper, the angle being rounded off. Sixteen inches below the ſecond keep, there are, on the ſides of the ſtocks catches, *i*, two inches high, an inch thick, and projecting four inches. The bottoms of the beetles are ſecured with an iron band, *m*, one inch and a half broad, and four lines thick, and armed with ſeventeen cutters, *n*. The order in which they are placed may be ſeen in Fig. 7. and the ſhape of them in Fig. 8.

P, (Fig. 4.) is a bracket ſix inches ſquare, with its brace, both mortiſed and pinned into the upright (Fig. 5.) There is another on the other upright, not viſible in Fig. 4.

Q, (Fig. 4.) a piece ſix inches ſquare, fixed to the brackets. The end of it might have been ſeen in Fig. 5. but it was not pointed out to avoid confuſion.

R, ſhoulders, reſting on, and pinned to the piece Q, notched at *o*, to receive the levers, Fig. 4. and alſo at *p*, Fig. 5. to receive their pivots.

S, levers which ſerve to raiſe the beetles, and keep them up while the troughs are emptied: they reſt on ſhoulders, R, where they play: they are made of a piece of even grained wood ſix inches broad, and two inches and a half thick: the length of the ſhorteſt arm is fifteen inches; that of the longeſt ſixty inches. The center of the point ſhould be on a level with the under part of the catches. At the extremity of the long arm is faſtened a cord, *g*, which is fixed to the pins, *r*, in the block, when the beetles are raiſed thirteen or fourteen inches. Another cord, *s*, is faſtened as near as poſſible to the end of the ſhort arm, which is tied to the ſame pins *r*, when the beetles are at work.

T, the turning axle-tree, ſeen endways, Fig. 5. and in front, Fig. 6. It is round, and fourteen inches diameter. It is furniſhed with twelve lifters, on four planes, ſo diſpoſed, that, when it is at work, the lifters anſwer the mortiſes, *b*, Fig. 4. by which they raiſe the beetles, without touching the ſides: they may all be ſeen in Fig. 5. Thoſe that are on the ſame plane, are diſtinguiſhed by the ſame figures, 1, 2, 3, 4, as well here as in Fig. 6. They are made out of pieces of wood, ſix inches broad, and two inches and a half thick: their tenons, X, Fig. 5. are two inches and a half by two, and as long as poſſible, without touching in the center of the axle-tree. From the center of the axle-tree, to the point of contact of the levers with the mortiſes, *b*, is twelve inches: this point is five or ſix lines under the mortiſes. Great care muſt be taken, that the tenons of the lifters be not made of croſs-grained wood.

V, V, (Fig. 7.) the baſe of a beetle, to explain the manner of placing the cutters, which are repreſented by black lines, as if only their edges were ſeen. The pricked lines make the diviſion of the ſuperficies to arrange them.

Y, (Fig. 8.) one of the cutters, marked *n*, Fig. 4, and 5. The height from the upper part of the ſhoulder to the edge, is four inches; the tongue three inches and a half; its largeſt part half an inch ſquare; the ſhoulder about eighteen lines diameter: the edges twenty-ſeven lines broad; they ſhould be ſteeled and ſhort.

The Fig. 7. and 8. are drawn by a ſcale, four times as large as the reſt, that their parts might be the better diſtinguiſhed.

MADS, earth-worms.

MAIZE, a ſpecies of grain ſo generally uſed for food in America, that it has obtained the name of Indian corn.

The ſize of its ear differs greatly, according to the fertility of the ſoil, and the warmth of the climate in which it is cultivated; but, at a medium, it is about a ſpan long, and commonly has eight or more rows of grain, each of which uſually contains upwards of thirty ſeeds, of various colours, as red, white, yellow, blue, olive, greeniſh, blackiſh, ſpeckled, ſtriped, &c. ſometimes in the ſame field, and the ſame ear: but the white and yellow are the moſt common: nor does this diverſity of colours ever reach beyond the outſide of the grain, the flour of which always is white, with a little tinge of yellow. Theſe ſeeds, which are as big as large peas, are round at their outer ſurface, very ſmooth, and ſet extremely cloſe, in ſtraight lines. The ear is cloathed and armed with ſeveral ſtrong thick huſks, which defend it not only from unſeaſonable rains, and the cold of the night; for it does not ripen fully in ſome places, till towards the latter-end of September, but alſo from crows and other birds, which,

which, being allured by the sweetness of the grain before it hardens, flock to it in great numbers, suck through the top of the outer covering, and devour as far as they can reach. In the northern colonies, the stalk of this plant, which contains a remarkably sweet pith, and is jointed like a cane, does not grow near so high as in the southern parts. It has long leaves, almost like flags, at every joint, and at the top a bunch of flowers, of various colours, highly pleasing to the eye. The northern Indians, far up in the country, have a species of this grain, called Mohawk's corn, which never grows high, and, though planted in June, ripens in due season. The general time of planting it, is between the middle of March and the beginning of June, or, more particularly, from the middle of April to the middle of May.

Mr. Ray was of opinion, that there are only two really distinct species of this plant; but Mr. Miller is certain there are three, which do not alter by culture, and he enumerates them in the following manner:

" The first of these, with yellow grains, grows naturally in the islands of the West-Indies, and has a very large strong stalk, which rises to the height of ten or twelve feet. Its leaves have a broad white mid-rib, are long, broad, and hang downward. The male flowers (for maize has both male and female flowers, situated at remote distances on the same plants) come out in branching spikes at the upper part of the stalks, and are from eight to ten inches long. The female flowers come out from the bottom of the leaves on the side of the stalk, and are disposed in a close, long, thick spike, which is covered closely with their leaves: out of the end of this cover hangs a thin long bunch of filaments or threads, which are supposed to convey the *farina fœcundans* of the male flowers to the germe of the female. When the seeds of this sort are ripe, the spikes or ears are nine or ten inches long, and sometimes a foot: but these rarely ripen in England.

" The second sort, which has white grains, is cultivated in Italy, Spain, and Portugal. The stalks of this species are slenderer than those of the former, and seldom rise more than six or seven feet high. Its leaves are likewise narrower, are hollowed like the keel of a boat, and their tops hang downward. The spikes of the male flowers of this are shorter than those of the former sort, and the ears, or spikes of grain are slenderer, and not more than six or seven inches long. The grains of this sort do not come to maturity in England, unless the season proves very warm, and they are planted early in a warm soil and situation.

" The third species, which has a yellow and white spike, is cultivated in the northern parts of America, and also in Germany. The stalks of this are slender, and seldom rise more than four feet high. Its leaves are shorter and narrower than those of the two former, are hollowed like the keel of a boat, and their tops hang down. The spikes of the male flowers of this sort are shorter than those of the others, and the ears, or spikes of grain, are seldom more than four or five inches long. This sort ripens perfectly well in England, in as little time as barley, and therefore may be cultivated here to advantage."

This plant is seldom cultivated in England for use, tho' it might probably turn to good account, as was lately experienced by a gentleman in Lincolnshire, who planted this corn in an open field, where it ripened perfectly, and yielded an abundant crop; but very great quantities of it are raised in Asia and Africa, in several parts of France, in Italy, Germany, and North America; its culture in the latter is given in the following manner, by a very worthy and ingenious gentleman of that country, who speaks from his own knowledge.

" The English in North America plough the ground thoroughly before the grain is planted. They seldom, if ever, dung the whole face of the field, but sometimes put a little dung in each hill of corn, if they think the ground requires it. Where fish are plenty, in the planting season, they put two or three small fish into each hill, with the grain.

" In order to plant the corn, they make trenches, or furrows, with a plough, across the field, at certain distances from each other, and cross these with others of the same distance, which divide the field into squares; and where the trenches intersect, the grain is put in, and covered. Three or four grains are commonly planted for each hill. The intermediate ground is afterwards ploughed at leisure, as the plants grow, and want more loose earth for the roots to spread in. The hills are made at the time of weeding; some loose earth being then hoed up over the roots, and round the stems or stalks of the corn.

" The corn is planted at different distances in different places. In the northern colonies, the Indian corn grows low; seldom exceeding four or five feet in height; and the leaves being proportionably small, the plants do not require so much ground as in the southern colonies, where they frequently rise to fourteen or fifteen feet. The space generally allowed for the lowest plants, is three feet, and for the highest five or six. This distance may be more necessary in our manner of cultivating this corn; more ground being required to nourish three or four plants than one; for I do not know that we ever pluck up any of the plants. An advantage attending this method is, that the labour is less in hilling; three or four plants being earthed up in the same time as one; and there is more room for passing between the rows when the corn is to be weeded.

" At the same time that the corn is weeded, the ground is loosened round the plants, with a hoe, and the hills are raised and enlarged from time to time, by adding more earth. The morning, before the dew is off, and the evening, are reckoned better for this work, than the middle of the day.

" The hilling of the corn, as it grows, has been the universal practice: the design being to give the plant more nourishment, and to support it better against the winds: but of late, some planters have thought it better to plant in holes: the reason is, that this plant requires a good deal of moisture; and indeed nature, by the form and position of the leaf, appears to have intended the receiving of the rain that falls around, and conducting it to the stalk, and by that down to the roots: but a hill round the stalk, tends to throw the water off to a greater distance: and as to supporting the plants, they say the hills do not affect it, because, by covering the stalks in that part from the air and sun, which would harden and strengthen them, the mould around them keeps them soft and tender, and thereby rather weakens them.

" The panicles, or tossils, contain the *farina fœcundans* of the plant, and therefore should not be cut off till the grain in the ear is filled. If the tossils of a whole field should be cut off before that time, there would be no grain at all in the ears. This has been proved by experiment.

" In the more southern colonies, where hay is scarce, and the leaves of this corn are very large, they cut them off for fodder: but in the northern colonies, where there is plenty of hay, and the leaves of the corn are small, they generally neglect cutting off the tossils, and stripping off the leaves. They are left on the stalks, and the cattle, being turned into the fields, after the corn is gathered in, eat what they like of them: but they are not esteemed so good as what has been cut in season.

" An easy way of taking the grain out of the ears is, to rub one against another, holding one in each hand.

" When the ears are stript of their husks, they are reckoned in the best state for preservation; much better than when the grain is rubbed off from the ear: for then, they say, insects can get at the soft part of the grain, and eat into it, which they cannot do while the soft part is connected with the cob in the ear, and the hard flinty part of every grain turned outward, and the grains close to each other.

" To preserve this corn, they make in North America a sort of bins, or cages, which they call corn-cribs, 15 or 16 feet long, and five or six wide, widening upwards to the top a foot or more. They are made of sapling poles, three or four inches diameter, framed roughly together, by notching the ends where they cross the corners, at such a distance from each other, as but just to keep the ears from falling through, that there may be a free passage for the air. These bins stand abroad, and have a slight moveable covering, or thatch, to keep out the rain. The Indians burry their corn in holes in the ground, lined with mats and dry leaves.

The manner of using this corn in America, is various. It has this advantage over wheat, that subsistance may be drawn

drawn from your corn-fields long before the general harveſt: for the green ears roaſted, are delicate food; and as the corn ripens and grows harder, the ears boiled are good eating, with butter and ſalt. When it is ripe, the corn parched and ground into meal, is the hunting and war proviſion of the Indians, being light to carry, and affording good nouriſhment. They mix a little of it with water, and it needs no other cooking, having already paſſed the fire in the parching. The grain ſoaked in water, will part with its ſkin when beat in a large mortar with a wooden peſtle: then it is boiled, and eaten with milk. Being pounded coarſely, dry, it is alſo boiled and eaten as rice. Bag puddings, and baked puddings made of it properly, are very good. The meal is alſo boiled with water, to make what they call a haſty pudding, which they eat with butter and ſugar, or with milk. This haſty pudding, or boiled meal, being mixed with twice as much dry wheat flour, and worked into loaves, makes much better and pleaſanter bread than flour alone. All creatures fed with Indian corn, have firm and fat fleſh: the pork of corn-fed hogs, is reckoned the fineſt in the world for taſte and goodneſs; their fat is milk-white, and as hard as butter. The horſes of Virginia and Maryland, whoſe chief fodder is the leaves and ſtalks of this corn, are reckoned the hardieſt of the ſpecies, bearing moſt labour, and requiring leaſt care; and the people of thoſe countries where it is the common food of men, are healthy, ſtrong, and hardy."

This corn is thought to keep better than wheat, and has frequently been of infinite ſervice in many countries in times of ſcarcity of other grain. It anſwers all the purpoſes of the white pea, of about the ſize of which its grains are, and would certainly be a better ſubſtitute for the poor, than bean-flour, or ſome other ſorts, which have been uſed even in England, where maize may doubtleſs be cultivated to advantage in light ſandy lands, in which beans and peas do not thrive well. It is excellent for feeding poultry, either given whole to the larger ſort of fowls, or broken a little for the ſmaller. The Breſcians, in particular, who are remarkable for the fatneſs of their capons, uſe a great deal of it for this purpoſe. The Indians reckon it a good remedy in all acute diſorders; and it has been obſerved, that thoſe people are very little ſubject to the ſtone, which ſome aſcribe to their living upon this corn. They extract from its ſtalk, when green, a ſweet ſyrup, which anſwers all the ends of ſugar; and when the ſtems are diveſted of their ears, and dried, they make excellent fences, coverings of ſheds, &c.

The Indians, and ſome Engliſh, particularly where the ground is good, and has been well manured with fiſh, plant with the maize, in every corn hill, a kind of French beans, which run up the ſtem of the corn, and are ſupported by it: others plant potatoes, gourds or pumkins, and others again ſow turneps, in the intermediate ſpaces between the hills.

Some curious perſons, by way of experiment, have planted ſeeds of only one colour in the ſame field, without any other coloured ſeeds near them, and their produce has been intirely of the ſame colour: but when the rows have been planted alternately with grains of different colours, they have interchanged, and produced a mixture of all the ſorts in the ſame row, and frequently, as was ſaid before, on one and the ſame ſpike. It is even affirmed, that they will mix with each other at the diſtance of four or five rods, if no tall fence or building ſtands between, ſo as to intercept their communication.

Mr. Miller, who mentions this, very rightly recommends the horſe-hoeing huſbandry, as, in all reſpects, fitteſt for the culture of maize; and gives the following as a method in which it has ſucceeded beyond expectation.

The land, which was very light and ſandy, and far from being rich, was ploughed deep before winter, and laid up in high ridges till the ſpring, when it was broken fine with the harrow. It was ploughed again in April, laid level, harrowed ſmooth, and then ſowed in drills four feet aſunder, into which the ſeeds were dropped at the diſtance of about eight or nine inches from each other. When the plants were about three inches high, they were thinned with a hand-hoe, by cutting up ſome of them where they grew too cloſe, and the intervals between the rows were ploughed ſhallow, to deſtroy the young weeds: but when the ſtems were advanced, the ground in the intervals was ploughed deep, and the earth laid up to the plants on both ſides; and when the weeds began to grow again, a third ploughing was given, to deſtroy them. This kept the ground pretty clean from weeds till the corn was ripe, as the ſeaſon did not prove wet; for otherwiſe a fourth ploughing would have been neceſſary. Each of the ſtalks of theſe plants produced from three to ſix ſpikes of grain.

Sir Richard Bulkley, who planted ſome of this corn in Ireland, from ſeed which grew in Brandenburgh, had, from each of his grains, which were ſet a foot aſunder in rows about a yard diſtant from each other, from three to ſix ſtems, and upon each ſtem three ſpikes or ears of corn, with two hundred and forty grains in each ſpike. An amazing increaſe!

Some good huſbandmen in France, have cultivated this grain upon nearly the ſame principles as thoſe which Mr. Miller points out. The little differences in their methods may not be un-inſtructing: for which reaſon we ſhall here give the ſubſtance of M. Duhamel's account of their management of this corn.

"Maize thrives better in a light and ſandy ſoil, than in ſtiff and clayey land. It cannot do without dung; and the ground intended for it ſhould receive two good ploughings in March. A third ploughing, which is given towards the end of April, makes the furrows for the ſeed; and what clods remain after this, are broken by hand, the furrows then preventing the uſe of a harrow.

"A fine clear day is choſen in May, to ſow the ſeed, which is done by making at the bottom of the furrows, with a ſtick or other inſtrument, ſmall holes, into each of which two grains of maize are dropped. The furrows are a foot and a half aſunder; and the holes, at the ſame diſtance from each other, are diſpoſed in ſuch manner that they form a kind of quincunx.

"When the corn is riſen, the weakeſt of the two plants is plucked up, where both ſeeds have ſprung; and where neither of them has grown, two new grains are planted.

"Towards the middle of June, the ground is hand-hoed round each plant; and as they ſtand in the bottom of a furrow, the mould which crumbles down, from time to time, lays freſh earth to their roots, and helps to ſupport them. About the end of July, a ſlight hoeing is given them, which is the laſt; and in ſo doing the earth is laid toward the roots of the plants.

"The panicles of the male flowers, which grow at the top of each plant, and are well known not to contain any grain, are cut off about the middle of Auguſt. But care muſt be taken that the grain be impregnated before they are cut off; which may be known by the then turgid appearance of the outward covering of the ears: nor ſhould the panicles be cut off from all the plants at the ſame time; becauſe ſome of the ears are not impregnated till a fortnight after others. Theſe panicles are excellent food for cattle. When they are cut, or ſhortly after, all the leaves are ſtripped off the ſtalks, together with all the blighted and ſmutty ears: for it is ſaid that the good ears would not grow ſo large, nor the grains be ſo well nouriſhed, if they ſhould be left upon the ſtalks. All theſe leaves and ears are given as fodder to oxen; and it is remarkable, that thoſe creatures are fonder of the ſmutty ears than of all the reſt.

"The time for reaping maize is towards the end of September. The ears are then gathered by hand, and put into baſkets, in which they are carried and laid in heaps from ſpace to ſpace in the field; after which they are loaded in carts, carried home, and ſpread upon an even floor prepared for that purpoſe. They are then taken out of their ſheath or hood, and dried in the ſun before they are laid up in the granary; or elſe the grain is taken out at that time. Maize which has been well dried in the ſun will keep ſeveral years, and not be the leſs fit for ſowing. The granary ſhould be very dry, and the corn laid up in it ſhould be turned at leaſt every three months, to prevent its growing muſty, or being attacked by inſects.

"There are two ways of taking out the grain. The firſt, which is the moſt expeditious, is by threſhing it with a flail: but in this method a great deal of the corn is broken or bruiſed. The ſecond, and more common, is by by rubbing the ears hard against the edge of a flat piece of iron. This easily separates the grains from the spike, or cob, without hurting them, and this remainder of the ear is very good food for oxen.

" As soon as the ears are gathered, the stalks remaining in the ground are plucked up, and laid by for winter fodder, for oxen. The field is afterward ploughed up as soon as possible: it being the general opinion of farmers, that the roots of the maize would otherwise continue to suck up the rich particles of the earth. Whether this be true, or not, their notion is, that if this ploughing should be deferred, the next year's crop would certainly suffer by it.

" When maize is planted only for fodder, particularly of cows and oxen, it is sowed very thick, and harrowed in, or covered with a rake, in a good soil, which has been ploughed twice, and well dunged: but it is observed, that in these thick sowings, all the female flowers are barren, and produce no grain: and it likewise is so great an impoverisher of land, that though the ground be dunged every time it is planted, wheat never does so well where this corn has grown, as in the neighbouring fields where it never was."

M. Aimen, M. D. in the province of Guyenne, where great quantities of this corn are raised, observes to M. Duhamel, 1. That it is important to sow maize rather in the beginning than at the latter end of May; because, if it is sowed early, the plants will have acquired sufficient strength before the great heats, to shoot out then with vigour; nor will their ears be burnt, or liable to that barrenness to which they are subject when this corn is sowed late; besides which, the stalks will be stronger, and their ears larger and fuller of grain. 2. That the ears of maize are greatly hurt by cutting the panicles too late; and that they ought to be cut before the hoods are open. By leaving a plant with its male flowers at every twenty feet distance, all the female ears will be impregnated.

In two different, but successive years, this gentleman singled out two rows of maize, the plants of which seemed to him equally strong. He cut off the panicles of the male flowers of all the plants in the first row, before their hoods opened, and let the panicles of the other row remain till the usual time of performing this operation: the consequence was, that the female ears of the first row were much the largest and best filled with grain.

He likewise sowed a row of maize at a distance from any other field planted with that corn, and cut off the panicles of that row before the hoods were opened; leaving only one plant with its male flowers at every twenty feet distance. At harvest, he observed, 1. That all the female ears of all the plants were impregnated. 2. That the female ears of the plants which had lost their male panicles early, were thicker, longer, and fuller of corn than any others. 3. That the female ears of the plants whose panicles had been cut late, were smaller and shorter, and that in some parts of them the grains were abortive.

To satisfy himself whether it be best to sow maize thick, or thin, he planted three different spots of ground with this corn, on the third of April 1753. The seed used for the first, where the grains were placed about a foot and a half asunder, according to the common practice of the country, in which experience had instructed the husbandman, weighed one ounce and one pennyweight: the second, in which the grains were only a foot asunder, was sowed with two ounces and two pennyweights of seed: and the third, in which they were but six inches apart, was sowed with four ounces and a half. The first of these spots produced eighteen pounds and four ounces of grain: the second, fifteen pounds seven ounces: and the third, eleven pounds two ounces. A manifest proof, as M. Duhamel observes, that some sorts of grain will not thrive unless they are sown very thin; and that, for want of this precaution, a great deal of corn is often lost, and the crops are considerably diminished.

As maize is a large plant, and requires much nourishment, it would certainly be right to try the culture of it with the horse-hoe: to this end, it will be proper to plant the rows two feet asunder, and the grains in them twelve or fourteen inches apart. All the necessary hoeings may then be given with the cultivator drawn by one horse; and I believe, with Mr. Miller, M. Aimen, and M. Duhamel, that the corn will thrive the better for it, and the land be afterwards fitted for other grain. It is worth the while of those who live in the countries where maize is cultivated, to try what will be the effect of this method.

MALANDERS, cracks in the bend of a horse's knee, that discharge a sharp indigested matter; they are often the occasion of lameness, stiffness, and the horse's tumbling.

This distemper is cured by washing the parts with a lather of sope warmed, or old chamber-ley; and then applying over the cracks a strong mercurial ointment spread on tow, with which they should be dressed, night and morning, till all the scabs fall off: if this should not succeed, anoint them night and morning with a little of the following, and apply the above ointment over it.

> Take of Æthiops mineral half an ounce; white vitriol one dram; soft green sope six ounces: anoint with this often, but first clip away the hair, and clear the scabs. On their drying up, it may be proper to give a gentle purge or two; or the nitre-balls may be taken advantageously for a fortnight or three weeks. *Bartlet's Farriery.*

MALT, is barley prepared, to fit it for making a potable liquor called beer, or ale, by stopping it short in the beginning of vegetation.

It is said, that the soil on which barley grows makes a considerable difference in the grain, and that the barley fittest for malt is that which grows on a rich, light, or gravelly soil, and which has been raised from seed brought from a farm of a different soil and situation. The fullest and largest grains of such a crop should be chosen for making malt. It should be heavy and perfectly sound, and such as has not suffered any accident in the field. Its being a little heated in the mow, is by some reckoned an advantage, because the grain will be the more equally dried, and will consequently the more equally imbibe water. If it has been so much mow-burnt as to look blackish when broken at the root end, or, as Mr. Combrune says, if it has suffered a heat of 120 degrees, it is unfit to make good malt. It is also found by experience, that barley taken immediately from the field does not malt so kindly as that which has been some time in the house, or mow. Special care should be taken that it be free from the seeds of weeds; for these, in the malting, are apt to give the grain a bad taste, which cannot be afterwards got rid of.

By germination, all the principles of barley are put in action. The heat which it undergoes in malting separates and divides its parts; and the viscidity which it before possessed is removed by the looser texture of its oils, and their intimate union with the salt, which gives malt the sweetish taste that distinguishes it from barley.

In order to its being malted, the barley is put into a cistern lined with lead or stone, and covered with water about six inches deep above the barley, to give room for its swelling. All the good grain will sink in the water; but, after stirring it, the imperfect or distempered grains will rise to the surface. These should be skimmed off, and given to poultry or hogs, for they will never make good malt. By the water's gaining admittance into the barley, a great quantity of the air is expelled; as appears from the number of bubbles which rise on the surface.

The barley is left in the water two or three days, more or less, in proportion to the heat of the weather and the dryness of the barley. A judgment is formed that grain is fully saturated with water, from its appearing turgid, and easily giving way to an iron rod dropped perpendicularly into it. Or, take a corn from the middle of the cistern, and hold it steadily, by the two ends, between the fore-finger and thumb: press it gently, and if it continues firm when so pressed, and the skin does not break, it must soak longer: if it crushes together and feels mellow, and the skin crack, it is watered enough. Nicety in this is a material point, and can be learnt only by experience. If the grain should be suffered to remain too long in the water, it would begin to to lose part of its sweetness. When it has been steeped sufficiently, the water is drawn off.

The water used for this purpose should be that of a clear running stream, or rain water; or, if such cannot be had, pond water, provided it be sweet and clean, will do very well; or pump water, which should be rendered soft if it be naturally hard. If the water made use of is any way tainted, it communicates to the malt a taste which it never loses. Mr. Combrune advises the adding of lime to the water in which the barley is steeped: but this seems to be improper, because it appears from Dr Home's experiments that lime renders water hard.

From the cistern, the barley is laid in a regular heap, or couch, where it must remain thirty hours, or till it contracts a heat. It must then be worked in one or more heaps, and turned every four, six, or eight hours, according as the weather is cold or hot. When it begins to spire, it should be turned every three or four hours, according to the temperature of the air; and as it comes (for so its spiring is commonly termed) the heap must be spread thinner to cool it, lest it be heated too much, and the germination be carried on too fast, by which the oils would be too much consumed. The turning of it must be continued in proportion as it is more or less slow in growth, so that it may be brought tolerably dry to the kiln. When the roots begin to deaden, the couch must be thickened again, and often turned, that the growth of the roots may not revive. At this time, the spire should be near piercing through the outer skin of the barley: for if it grows quite out, the strength of the malt will be too much consumed. After the malt is made thus far, the common practice is to lay it at once on the kiln: but the best way is to gather it all up in one heap, to let it lie in that state twelve hours, and then to turn it every fourth hour, during the space of twenty-four hours.

No person should be suffered to tread on the malt with their shoes, while it is on the floor; because many grains are inevitably bruised thereby, and these, vegetating no longer, afford the roots of the other grains a substance into which they extend their fibres, and are by that means intangled in bunches: and besides this, the bruised corn acquires a degree of putrefaction which taints the liquor made of the malt intermixed therewith. Equal care should also be taken, that the grain be not bruised by any other means.

Mr. Combrune thinks, that the time most proper for malting is when the temperature of the air is such that barley begins naturally to germinate, at which season the thermometer marks from between thirty-two to forty degrees. How far that time may be extended, experience alone can determine. The warmer the weather is, the greater must be the disadvantage under which the maltster labours; because the motion of the fluids is then so strong, that the process goes on too quick, and the finer parts are apt to fly off; the consequence of which is, that instead of a sweet, the malt inclines to a bitter taste, the oils being turned rancid. This is so universally experienced, that brewers carefully avoid purchasing what is termed latter made malt.

The grain thus prepared for drying is spread on the kiln, where, meeting with a heat greater than is suited to vegetation, its farther growth is stopped. It is spread on the kiln three or four inches thick, and turned every three or four hours. The laying of it thicker is attended with inconveniencies, among which is particularly its being unequally dried; and therefore that should be avoided. The strength and duration of the fire is different, according as the malt is intended to be dried, pale, amber, or brown. The pale malt requires more leisure, and less fire, than the amber or brown.

Pale and amber malt are dried with coke or culm, which not emitting any smoke, give the malt a brighter colour, and do not communicate that bad relish which malt has when dried with wood, straw, &c. the smoke of which taints it. Coke is best, because its fire gives a steady and constant heat, whereby the malt is dried uniformly. If wood, or any vegetable fuel is used, it should be extremely well dried, in order that, being as free as possible from moisture, it may yield the less smoke.

The size of the malt kiln is generally proportioned to the quantity of malt for which it is intended. Some build their kiln square, and others make it round; but this last is undoubtedly the best form, because the heat of the fire is more equally diffused therein, and the grain is of course more equally dried. Various substances have been made use of for covering the kiln, such as tiles, plates of tin, and wire: of these, the wire is to be preferred, because it does not contract so great a degree of heat as to parch the grain in contact with it: but, for this very reason, hair cloth is preferable to any other covering; because, when any part of the malt is in immediate contact with a substance much more solid than itself, and therefore capable of receiving a proportionably greater degree of heat, the malt in contact with that heated body is parched or burnt, by heat which is not equally diffused through the whole mass, which mass cannot therefore be all equally heated. The hair cloth is spread upon small wooden rafters, and these are supported by bars of iron laid across the kiln.

An ingenious and attentive maltster marked the degree of heat in the malt whilst on the floor: and the result of his observations in this respect is as follows. During the first ten days that the malt was on the floor, the heat in it was between 50 and 60 degrees. During the next three or four days, the heat was increased from 60 to 65 and 67 degrees; and during the last days of its lying there, to 80, 84, and 87, which last was the degree of heat when the malt was put on the kiln. There cannot be any absolute rule as to the difference of heat during the different times in the process of malting, because it must be suited to the heat of the air: at least we have not yet sufficient data whereon to found such a calculation. The heat of the malt on the kiln when fit for pale malt was 120 degrees, and when it was fit for brown the heat was 147.

This intelligent artist's observation, that the malt was fit for what is called pale malt when its heat was at 120 degrees, suggests a caution which should be most carefully attended to, namely, that whatever colour it be intended to give to the malt, the heat at first should always be the same: thus, for example, malt which is dried to the degree of high brown, should first be rendered pale malt, then amber, and so on progressively; not by a sudden increase of the fire, but by a longer continuance thereof. In this manner, the whole body of the grain is equally and gradually dried; whereas a strong and quicker fire would parch, or as it were singe the outside, while the internal parts remain moist: and as that moisture is afterwards evaporated, it must crack the surrounding hardened crust, whereby the grain is again damaged in another respect.

As soon as the malt is dry, it must be removed from the kiln, and spread thin, that it may cool to the temperature of the air. It cannot be supposed, that any of its parts are capable of retaining the fire in such manner as not to suffer it to escape; though some have conceited that they do. In proportion as malts are dried, their particles are more or less separated, and coming in contact with water, they strongly attract from it particles which fill up their interstices. In mashing, this action between the malt and the water generates a small degree of heat, but no way durable; though from hence arose the opinion, that brown malt is full of fire.

Barley may, at a medium, be said to lose, by malting, one fourth part of its weight, including what is separated from it by the roots screened off: but this proportion varies, according as it is more or less dried.

The condition of the barley, as to its greenness or ripeness, at the time of its being gathered in, is clearly discernable when it is melted. If it was gathered green, it rather loses than gains in quantity, the malt becomes of a smaller body, appears shrivelled, and often is unkindly hard; whilst, on the contrary, that which was cut at full maturity increases in malting, appears plump, bright, and clear, if properly carried through the process, and, on being cracked, readily yields that fine mealy substance so much desired by the brewers.

Malt which has not had a sufficient time to shoot, so that its plume, or acrospire as the adepts in malting call it, may have reached to the inward skin of the barley, remains charged with too large a quantity of it's unattenuated oils. All thoſe parts which have not been put in motion by the act of germination, will, when laid on the kiln to dry, be ſo hardened, as not to be ſoluble in water, and conſequently will be loſt to the ſtrength of the drink.

When malt is ſuffered to grow too much, or until the ſpire has ſhot through the ſkin of the barley; though all that is left be malt, yet, as too large a portion of its oils will have been expended in vegetation, the malt will be greatly diminiſhed in proportion to what it ought to have been, and what remains cannot be fit to brew drink for long keeping, becauſe of the loſs of the oils.

Malt which has been duly worked on the floor, will, if it has not been ſufficiently dried on the kiln, be apt to germinate or ſprout afreſh; perhaps to conceive ſo great a heat as to take fire; and ſhould it continue long with a moderate degree of heat, the leaſt evil that can be expected, is that it will grow mouldy and have an ill flavour.

Malt well worked, but over-dried, will be ſo hardened, or its ſaponaceous quality will be ſo deſtroyed, that it will not imbibe from the air that moiſture which is neceſſary to mellow it, and render it fit for brewing: for when it has been previouſly ſoftened by the moiſture of the air, it mixes more eaſily and more intimately with the water, and by that means yields a more copious extract, than it would otherwiſe do.

Malt juſt, or but lately, taken from the kiln, remains warm a conſiderable time. Until it becomes as cool as the ſurrounding air, it does not mellow by the addition of a due quantity of moiſture from the air: and the wort made of ſuch malt requires a much longer boiling before it breaks, than that which is made of malt ſome months old.

The practice of thoſe maltſters who ſprinkle water on malt newly taken from the kiln, to give it the appearance of having been made a proper time, or, to uſe their own expreſſion, to plump it, is highly blameable. It is, in fact, a downright fraud, practiſed chiefly becauſe leſs grain then fills the buſhel: but a farther evil is, that if it be not uſed ſpeedily, it heats, ſoon grows mouldy, and ſuffers great damage.

Malt dried on a kiln not ſufficiently heated muſt require a proportionably longer time for it to receive the due effect of the fire: for want of which it will be in the ſame ſtate as malt not thoroughly dried. Or if the fire be too quick, or too fierce, inſtead of gently evaporating the water from the corn, it ſcorches the outward ſkin, and ſeparates it from the body of the grain. The malt to which this happens is called blown malt; of which Mr. Combrune obſerves, that, by the internal expanſion of its parts, it occupies a larger ſpace than it ought to do. He adds, that if ſuch a fire be continued, it changes ſome parts of the grain into ſo brittle a ſubſtance, that the malt is ſaid to be glaſſy. The particles which are thus hardened will not diſſolve, or but in ſmall proportion: ſo that they frequently occaſion an almoſt total want of extract, which, in the phraſe of the art, is termed, ſetting the griſt.

The goodneſs of malt may be known by the following marks. Bite a grain of it aſunder, and if it taſtes mellow and ſweet, breaks ſoft, and is full of flour from one end to the other, it is good. If it has a round body, and upon putting ſome grains of it into water, they ſwim on the ſurface, it is good. Barley ſinks in water, and malt that is not well made will do the ſame: but it is to be obſerved that this is not an invariable proof, becauſe, if the malt be broken, or in the leaſt cracked, it will take in water, and ſink. Malt that is rightly made will not be hard, but of ſo mellow a nature, that if drawn over an oak board, acroſs the grain, it will leave a white line upon the board, like a mark of chalk. Its ſmell alſo may be conſulted; for malt, though otherwiſe good, may have contracted an ill ſcent from the fuel, or from the water uſed in the ſteeping.

Before malt is ground, it ſhould be freed from the tails and duſt, which would otherwiſe heighten the colour of the wort, render the liquor muddy, and give it a bad taſte, which could not afterwards be got rid of. The cylindrical ſieve will be of excellent uſe for this purpoſe.

The malt muſt be broken, in order to its communicating its virtue to the water. If it be ground too ſmall, its flour will mix too freely with the water, and cauſe the wort to run thick. Many are of opinion that the beſt way is only to crack it, ſo that none of the grains may come out whole: for the intent is, that the water ſhould draw out an extract, but not be mixed with the mealy part, in the manner of a paſte, or gruel. Some think that malt is better ground by a ſtone mill, than by a ſteel one, becauſe the former bruiſes it, and the latter only cuts the grains.

After the malt is ground, it ſhould lie ſome time to mellow, in a cool room, where no ſun comes. The time for this is different, according to its kind. Brown malt may be ground at from three to fourteen days before it is uſed, in order that the corn, which is rendered uncommonly hard by that degree of drying, may be gradually ſoftened by the moiſture in the air; by which means it will become the more ſoluble in water. The pale malts require only one or two days. After lying thus in the air, leſs maſhing ſuffices; the ſtrength of the malt is more perfectly extracted, and the beer will be conſiderably ſtronger than it would be with the ſame quantity of malt taken directly from the kiln. Care muſt be taken that it get no damage in lying.

Mr. Combrune obſerves, that malt imbibes moiſture more readily by being ground and expoſed for ſome time to the air, than it does when whole; and that as the dampneſs thus abſorbed by the grain is in reality ſo much cold water, malt which has been long ground requires to be maſhed with hotter water than it would otherwiſe be neceſſary to uſe. *See the article* BREWING.

The reader is obliged for the following uſeful obſervations on the art of making malt to a very ingenious gentleman, who has practiſed the art many years.

Experience, and a conſtant obſervation on effects and their cauſes, have, ſays he, made me maſter of ſome pieces of knowledge relative to this ſubject, which your farming readers may probably think worthy their attention: the reſult of this experience I ſhall lay before them.

The firſt thing I ſhall mention, with regard to malt, is the benefit of changing the water whilſt it is ſteeping.

Some maltſters think this change of water no ways neceſſary; others, on the contrary, approve of it, but do it indiſcriminately in the ſame proportion during the whole ſeaſon. They are in both reſpects wrong; for the times when the water requires to be changed ofteneſt are at the beginning and latter end of the ſeaſon, in autumn and ſpring, when the weather is warm; for in the middle of the winter the weather is too cold to admit of the water being at all changed to any advantage. Suppoſe the barley to be left in ſteep forty-eight hours in the ſpring: if the weather is inclinable to be warm, the water may be in that ſpace of time changed three times; in other caſes twice may be enough; but the beſt rule to go by, is that which follows.

Every maltſter muſt know, that in the autumn and ſpring, if barley is left too long on the ſteep in the ſame water, the water will grow ſlimy, and ſometimes ſour: now I would adviſe the maſter to watch the changes of the water, and when he finds that it is ſmooth and oily to the touch, and that it is inclinable either to ſmell or taſte ſour, let him by all means have it inſtantly changed; but he muſt obſerve, if he regards his intereſt, a particular method even in doing this.

The uſual way of changing the water is, firſt to draw off that in which the barley was ſteeping, and afterwards, by pails full, or by pumping, fill the ciſtern again.

This I do not approve of, becauſe the barley when the water is drawn off lies cloſer, and is apt, in a very ſhort ſpace of time, to heat: this is a great damage to the commodity, and, without precaution, a conſiderable loſs enſues. Now my method has always been, firſt to get a hogſhead of water in readineſs near the ciſtern, which I cauſe to be thrown on the barley the inſtant the firſt water is drawn off; and as a hogſhead of water is ſufficient to wet eight buſhels of barley, I add afterwards as many hogſheads, ſave one, as my ciſtern will wet quarters. By theſe means I avoid the danger of the barley heating in the ciſtern.

The conſequences of not changing the water whilſt the barley is ſteeping, are often fatal to the malt, which either forts of water near his houfe with fome white hard fope, fuch as is made at Nayland; and that which lathers fooneft is moft fuited to his purpofe.

I have already obferved, that in the fpring and autumn it is neceffary to change the water often in which the barley is fteeped: it fhould likewife be remembered, that in thefe feafons the making of malt, in all its parts, is a very critical bufinefs; particularly it is then neceffary that the beds, or couches, fhould be frequently turned, or the malt will not come kindly; but the tap root will be apt to fhoot forth vigoroufly, ftarving the other roots, and preventing them from accompanying it in its growth: this muft be checked, and the remedy is, to turn the couch often, fpread it thin, and give it a fufficient quantity of air, at the fame time keeping it cool and temperate. This will ftop the progrefs of the firft root, give the others time to fprout, and the barley will malt kindly and regularly.

A thin fkinned fine-coated barley is beft for making malt, and it is not the worfe for not being very full bodied; yet would I by no means recommend a lean, half-ftarved, unripe grain.

Barley, which has grown on lands highly manured, is not fo good for making malt, as that which has been produced by land of a moderate richnefs without any manure: in fact, a luxuriant foil, whether naturally fo, or enriched by art, is not, in general, beft for yielding barley for the maltfter's ufe.

For the reafons above mentioned, never chufe to buy barley from the farmers who have large crops, as it is moftly a full-bodied grain they have to fell. I prefer, for malting, a grain which is the produce of a foil that is rather poor than rich, rather light than ftrong, and more inclined to a gravel than a clay.

This grain is clean-coated, taper, and elegant in its form, is full of flour, almoft tranfparent when watered, and will be fufficiently wetted in forty-eight hours.

This grain increafes in the malting, fills the bufhel well, and makes a fine, fweet, wholefome, clean, full-bodied malt, from which the beft of beer may be brewed, either brown or pale, according as the malt has been dried higher or lower.

Now I have mentioned drying of malt, a few cautions on that head may not be amifs.

My practice has been to give my malt as much drying as I could on the floor: this is not only a great faving of fuel to me, but is alfo attended with feveral other advantages.

I find that my malt, by being thus gradually divefted of its outward moifture, does not fhrink fo much when it comes to be laid on the kiln; of courfe it meafures to more advantage: it is befides of a better quality, having acquired no foreign tafte in drying.

It may very eafily be obferved, that if malt is laid very damp on the kiln, a thick mift, or fmoky vapour, will immediately arife from the furface of it, which, being repelled and condenfed by the cold circumambient air, falls again on the malt, where, by the heat from the furnace, it is a fecond time rarefied, and afcends in clouds of fteam.

This alternate rarefaction and condenfation of the moifture is of great differvice to the malt, giving it often a difagreeable mufty flavour, and making it befides more unfit for keeping.

Now, by my method of fuffering the malt to receive a part of its drying on the floor, this inconvenience is, in a great meafure, avoided; for the grofs moifture is already evaporated before it is laid on the kiln, and that which remains creates no great degree of fteam, provided the fire in the furnace is not at firft made to burn too fierce.

With this precaution I have often made pale malt as fine as I have any where feen, fuch as fome gentlemen, who long dealt with me frequently, nay, conftantly, praifed. In drying this malt, I took care that there was, during the whole time it was on the kiln, but a very moderate, yet equal, fire in the furnace.

If I had an inclination to have any malt high dried (for fome like brown malt better than pale) when the moifture was nearly evaporated, I caufed the fire to be gradually encreafed till it roared again in the furnace, taking care that the malt fhould be properly ftirred, left it proved kiln-burnt; and by this method I had a fine, fweet, brown malt, fit for making harveft beer, fuch as fome farmers are very fond of brewing.

Many are of opinion, that brown malt, ufed in the fame proportion with the pale, will make the ftrongeft beer; but this is certainly a miftake; for I have often made the experiment with great precifion, but could never find any material difference, and what difference there was at any time, feemed to me to be rather in favour of the pale than the brown malt: this may eafily be accounted for, as the flour in the pale malt always remained found and uninjured in the drying; whereas the brown malt would fometimes, notwithftanding all the care of the maltfter, be injured or parched by the fire, and that part which was parched had of confequence loft its fpirit and virtue.

I muft, however, on this occafion, make one neceffary remark, which is, that fome pale malts are flack dried: thefe, I own, make a raw unwholfome liquor, which will not keep well; but if the pale malt is gradually and flowly dried by an uniform gentle heat, it will certainly anfwer the character I have already given of it, and will, befides, (I have experience for my voucher) keep as well as any brown malt whatever.

Maltfters in general are too little nice in the barley they buy. I have already faid fomething on this head, to which I fhall add, that I would by no means have them ever bargain for mixed grain: what I mean by mixed grain, is barley grown on various foils, and in different fields. There is a fure difappointment in buying fuch grain, as the kerns will fpire at different times, and fome of them not at all; fo that, after the couch is dried, fome part of it will not be half malted, and a great deal of the remainder not malted at all.

In order to avoid this misfortune, for fuch it is, as the maltfter's cuftomers will, with too much reafon, find fault with his commodity, let him by no means attempt to buy tythe barley, for that he is fure is mixed: I experienced myfelf, many years ago, a great lofs by a purchafe of the kind. A neighbouring farmer, with whom I was well acquainted, brought a fample of barley to market: I looked at it, and though it was not very fine, I bought it, on account of his letting me have it fix-pence a quarter cheaper than I could then buy of others: the lot confifted of one hundred quarters; but when it came home, and I had tried fome of it, I think about ten quarters, I was greatly furprifed to find the malt fo bad, when examining the barley with great attention, I foon difcovered the reafon of it. Meeting the farmer, of whom I had bought it, within a day or two afterwards, I afked him how he came to fell me mixed barley, adding, that I always thought he kept his grain with more care feparate: he foon unravelled the myftery, by telling me, that it was the parfon's barley, not his own, which he fold me.

When I heard this, I was not a little difpleafed; however, refolving to make the beft of a bad bargain, I carried a fample of it to market the next day, and fold it to a hog-feeder for eighteen-pence a quarter lefs than I gave for it. This was fome lofs; however I was glad to get off fo well, as I would not have made the whole into malt, and have impofed on my cuftomers for an hundred pounds.

To fhew that I am not felf-interefted, I will inform your readers of a method by which they may difcover whether malt has been made of mixed, or in part unripe barley. Take a bowl of water; throw into it a couple of handfuls of the malt; give it a gentle ftirring, and the barley which has not been malted will fink to the bottom; the half-malted grains will have one end funk, being in a vertical pofition; and the true good malt will fwim. This experiment I have often made, and never found it deceive me.

The fame barley, though ever fo good, will not malt alike well at all times: for inftance, take it as foon as it is houfed, it comes well, but whilft it is in its fweat, by no means; yet after it has done fweating, it comes well again.

In the fame manner, barley which has been got in early in a very dry feafon, makes but indifferent malt; whereas the fame barley, if it is left abroad till rain falls on it to loofen the hufk from the kernel, malts very well, and yields a large increafe.

Alfo, old barley, mixed with that of the laft harveft, does not malt well, for the reafons above mentioned; it does not all fpear, or put forth its beard, at the fame time.

Thefe I know are niceties which few maltfters attend to; yet I am certain that an obfervance of them, and fome few more particulars, would increafe their profits nearly ten per cent.

A great many maltfters in the counties of Hertford and Effex, make prodigious quantities of malt for the London market; and there are often difputes happen between the maltfters and the factors and buyers at Mark-lane, about the malt not holding out meafure; the reafon of which many of the country dealers are unacquainted with, and therefore know no other way of guarding againft it, than by throwing in a bufhel or two extraordinary: this is fome abridgment of their profits, and is befides often unneceffary. One reafon for this deficiency, is the avariciousnefs of the maker, who is willing to have as large an increafe as poffible, to the amount of fix pecks in eight bufhels; whereas, if the malt is intended for the London market, four pecks is all that can, with propriety, be allowed; for it muft not be drawn too long; and this malt requires more cleaning by the fcreen, &c. than that fold in the country.

Malt, if it is not thoroughly cleaned, will heat in the hold of the veffel that carries it; and the tails, being loofened, will fall off; the neceffary confequence of which muft be a deficiency when it comes to be meafured a fecond time at the wharf or ware-houfe: now, to prevent any altercation or difpute, let the maltfter always caufe his commodity to be well fcreened before it is meafured into the facks to be carried on fhipboard: he need then put up no more than the meafure; he will gain himfelf a character as a clean good workman; and I will anfwer for it, that the factors, if he makes his malt according to fample, will readily give him one fhilling a quarter more than his neighbours.

MALT-DUST, the duft, &c. that feparates from the malt in the act of drying.

The following obfervations on the benefit of malt-duft, as a manure for a ftiff foil, with a relation of fome experiments made to afcertain its virtues, appeared in the *Mufeum Rufticum*, *vol.* III. *page* 277.

For the benefit of your farming readers, fays this gentleman, I fhall communicate a few experiments I made fome time fince, in order to try the virtue of malt-duft as a manure for a crop of wheat.

I had often heard it afferted, that malt-duft was much better fuited, as a manure, to barley than wheat; for the latter lying a whole year in the ground, and the malt-duft being fown with it, the virtues of the manure were exhaufted long before the fummer, when the corn principally wants nourifhment; being advanced in its growth, and ferved chiefly to make the wheat winter-proud.

Others, contradicting this affertion, faid it was beft for wheat, and made it appear, that it often caufed very good crops of corn, particularly after a hard winter.

Being determined in my own mind to try fome experiments, in order to determine this matter, I pitched upon a field of ten acres, which had borne a good crop of horfe-beans; after which it was fown with turneps, which being fed off, it was fummer-fallowed, being intended for wheat.

The foil was a ftiffifh loam; it was in good heart, and tolerably clean.

I divided this field by deep furrows into ten equal parts, each containing one acre, numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

The whole field, during the courfe of the fallowing, had four ploughings, which reduced it to a fine tilth.

When wheat feed-time came, I fowed number 1. broad-caft, with three bufhels of wheat, and ploughed it in, laying on no manure whatever.

Number 2. I fowed with the fame quantity of wheat, after which I ftrewed over it ten quarters, or eighty bufhels of malt-duft, and ploughed that and the feed in together.

Number 3. I fowed alfo with wheat in the fame manner, except that I deferred ftrewing on the malt-duft, till the latter end of January.

Number 4. had a dreffing of dung in the ordinary way, and was fowed with three bufhels of wheat like the other parts.

Number 5. was dreffed by fheep-folding, and was alfo in like manner fown with wheat.

Number 6. was fown with wheat in the fame quantity; and in February, after fowing, received a half dreffing of very rotten dung, which had been feveral times turned and mixed.

Number 7. after receiving a ploughing in the fpring, was fown with ten pecks of barley, which was harrowed in, and no manure at all applied.

Number 8. was fown with barley, as above, but had ten quarters of malt-duft laid on it.

Number 9. had in the winter a good dreffing of dung, and was in the fpring fown with the fame quantity of barley.

Number 10. was fown with barley, like number 8. only it had five inftead of ten quarters of malt-duft laid on it.

It may be neceffary, perhaps to obferve, that all the pieces of wheat were fown the firft week in October, and all the barley the fecond week in March.

Soon after Chriftmas I went to take a view of my wheat, when I found that the acre marked number 2. looked moft forward and flourifhing; though I muft own there was in appearance but little difference between that and number 4.

The numbers 1, 3, and 6. neither of them looked fo vigorous as thofe already noticed; and number 5. feemed rather thin on the land; but the wheat plants were in good condition and healthy.

In May I took another view of my wheat crops, and found number 1. tolerably clean, and promifed well.

Number 2. gave me hopes of a large crop, and was furprifingly clear of weeds.

Number 3. was greatly improved fince the laying on of the dreffing of malt-duft.

Number 4. looked very vigorous and ftrong, but was very foul, having feveral forts of weeds not to be met with in other parts of the land.

Number 5. was thin of plants, and they did not branch much; however, they ftill feemed healthy and ftrong.

Number 6. was like number 3. greatly improved; but it was foul, and, what appeared ftrange to me, had many weeds of a nature quite different from thofe with which number 4. was infefted, though the dung laid on both thefe parts was taken from the fame heap.

I, at this time, alfo looked at my pieces fown with barley, when I found number 7. promifing and clean.

Number 8. was forwarder, and flattered me with the profpect of a large crop.

Number 9. was forward and fine, but foul with weeds.

Number 10. bore much the fame appearance as number 8. and promifed as well.

At harveft number 2. of the wheat was firft fit to reap, after which fucceeded number 4. the reft were ready nearly at the fame time.

Of my barleys, number 8. and 10. were firft ready to mow.

I fuppofe it is unneceffary to obferve that thofe crops which were cleareft of weeds were the fooneft fit for carrying.

I ordered thefe crops to be all laid feparately; and as I was obliged, juft after Michaelmas, to go up to London, about fome particular bufinefs, I left orders with my bailiff, that they fhould all be feparately threfhed and dreffed as early as might be in the winter.

The produce of the feveral crops was thus diftinctly noted to me, for I had ordered that particular care fhould be taken not to mix one with the other, and my orders were, I found, on enquiry, punctually carried into execution.

	Bufh.	Pecks.
Number 1. unmanured, yielded of wheat –	20	1
Number 2. manured with malt-duft when fown – – – – – – – – – – – –	28	3

 Number

Number 3. manured with malt-duſt after Chriſtmas, by way of top-dreſſing	41	0
Number 4. manured with dung in the ordinary way	32	2
Number 5. folded with ſheep	29	3
Number 6. dreſſed with rotten dung in February	30	0
Number 7. unmanured, yielded of barley	32	3
Number 8. manured with ten quarters of malt-duſt when ſown	48	0
Number 9. manured with dung in the winter	40	2
Number 10. manured, when ſown, with five quarters of malt-duſt	44	0

I muſt, with your leave, treſpaſs upon your reader's patience, till I make a few obſervations on the above ſtate of the produce of my crop.

Firſt, I conclude, that when malt-duſt is uſed as a manure for wheat, it is beſt to lay it on by way of top-dreſſing after the corn is come up, as the crop of number 3. yielded above twelve buſhels more than that of number 2. and I am apt to think that the virtue of the malt-duſt laid on number 2. was exhauſted before it could be of any eſſential ſervice to the crop; whereas, in number 3. the manure began to yield forth its virtues juſt as the wheat plants began to be in want of a freſh ſupply of nouriſhment. It was alſo obſervable, that the grains of wheat which grew on number 2. were thinner, and had leſs ſubſtance, than thoſe of number 3. the grain of which was fine, plump, and heavy.

The produce of number 4. convinces me that malt-duſt is, in many caſes, a better manure for wheat than dung, not only as it gives a larger encreaſe, but alſo becauſe it does not ſtock the land with deſtructive and devouring weeds.

The wheat grown on number 5. was as fine as that of number 3. but conſiderably leſs in quantity, as appears by the account.

I do not much approve of the method purſued in number 6. yet is it a good alternative, if the farmer happens to have too little dung to dreſs all his fallows.

I judge alſo malt-duſt to be a very good and profitable manure for a barley crop; but the yield of number 10. being forty-four buſhels, and of number 8. only forty-eight buſhels, which laſt is not an encreaſe in proportion to the additional quantity of manure laid on, I thence judge that eight quarters, or ſixty-four buſhels, of malt-duſt, is the proper quantity of malt-duſt to lay on an acre for a barley crop, and that at the time of ſowing.

When I ſpeak of malt-duſt, I mean the kiln-d.ſt, which falls from the malt in drying: as to the tail-duſt, which falls through the ſcreen whilſt the malt is cleaning before it is put up in ſacks, that may be applied to a better uſe, being generally given to pigs, and often to cows, in which laſt caſe it makes them give a great deal of milk.

It has been ſuggeſted that the virtue of malt-duſt, as a manure, laſts only for one crop; but this is a miſtake, for when this manure is laid on in January or February, a good crop of barley may be had after the wheat.

It (I mean malt-duſt) is of a very warm nature: this has induced many farmers to think that it will burn a crop; and I will not anſwer for it but it might do ſo on a hot gravelly ſoil; but on clay land, or a ſtiff loam, it ſeldom or never does any damage: and indeed the only danger is a dry time enſuing after it is ſpread on the land, for the firſt ſhower of rain waſhes it in, and ſecures the crop from all hazard of being burnt.

Many of my acquaintance, beſides myſelf, have found that malt-duſt is for a ſtiff ſoil a better manure than dung; but the diſpute among them was, whether it was moſt profitable to lay it on when the wheat was ſown, or by way of top-dreſſing in January or February: however, ſince I made the above experiments, they are all converts to my opinion, and are determined in future always to dreſs their heavy wheat land with it after Chriſtmas.

One thing more in recommendation of this my favourite manure let me add before I conclude, that nothing ſurpaſſes it when laid on cold graſs grounds, to the amount of about eight quarters, or ſixty buſhels, on an acre, but not leſs.

Such as have not ſeen its effects in this way applied, would be ſurpriſed at the large encreaſe of ſweet feed which it occaſions: in ſhort, whoever finds it neceſſary to dreſs ſuch land, and can get malt-duſt in a ſufficient quantity, will do well to uſe it, as they will be puzzled to find any thing in the extenſive circle of manures better adapted to the purpoſe.

MANGER, the place or veſſel in which the horſe's corn is put.

MANURE, a general name for ſoil of all kinds laid upon land to improve it. *See* DUNG.

The following Letter ſent to Dr. Templeman, *Secretary to the Society for promoting Arts, &c. to be by him communicated to the Committee of Agriculture, in Recommendation of a new Manure, is of too much Importance to be omitted here.*

"SIR,

"As a farmer, like a chemiſt, ſhould loſe none of his materials, but make even his waſhings, runnings, and reſiduums, turn out to his advantage, I have ſent you ſome account of an experiment I have made in manuring of land, which I beg you will lay before the committee of agriculture, that they may communicate it to others.

"I am poſſeſſed, Sir, of a farm of near three hundred pounds a year, and have in my yard, what you uſually ſee in moſt farmers yards, two receſſes or pools, as reſervoirs of dung and water. Theſe reſervoirs in wet weather are continually running over; and of courſe part of the matter contained in them is carried off, by the neceſſary drains, into the highways, ditches, and rivers.

"As much of the eſſential quality of the dung is loſt in this manner, (for part of the ſalts, whether fixed or volatile, will be waſhed into the pools, and when they over-run, will be conveyed into the ditches, &c.) I thought it a part of good huſbandry to carry this ſuperabundant water, or manure, (for ſo we may juſtly call it) on my land, which I did by means of a watering-cart, not unlike thoſe with which the roads near London are watered in the ſummer time to allay the duſt.

"That the experiment might be the more obvious and certain, I firſt tried it (in the beginning of March, 1763) on a few acres in the middle of a large meadow, and on ſome lands in the middle of a large field of wheat, where, in a little time, I found a conſiderable encreaſe, in growth, both of graſs and grain; and at hay time and harveſt, both the one and the other were much better crops than what the ſame lands produced that were not ſo manured.

"As a man, or even a boy, with one of theſe carts, and one horſe, may manure a great deal of land in a day, provided it be near the yard, I would recommend the practice to all my brother farmers; for the expence is nothing, but the value of the time of the boy and the horſe; and the encreaſe, by what I have ſeen, will be very great.

"This manure may be alſo laid, to great advantage, on land that is freſh ſown with barley, oats, or any other grain; but on graſs it ſhould be only laid in the winter time, when the rains will waſh the ſalts off the blade; or in the ſpring, when the lands are laid up for hay; as the cattle will not feed on the graſs, while the dung, or ſalt, adheres to the blade of it.

"This dung-water ſhould likewiſe be carried on the land, not at a time when it rains, but in the dry weather, and at a time when the dung-water in the pools is of a deep brown colour, and ſtrongly impregnated with ſalts. By this means the land may be manured from time to time, and the pools kept almoſt empty for the reception of freſh matter every time it rains; and nothing will be loſt.

MARE, the female of the horſe. *See the article* HORSE.

Such mares as are deſigned for breeding, ought to be as free from defects as poſſible, and ſhould, no more than the ſtallions, have either moon-eyes, watery-eyes, or blood-ſhot-eyes; they ſhould have no ſplint, ſpavin, or curb, nor any natural imperfection; for the colts will take after them: but choice ſhould be made of the beſt and ableſt, the moſt high ſpirited, beſt coloured, and fineſt ſhaped; and the natural defects that may be in the ſtallion, ſhould be amended in the mare, as well as that which is amiſs in the mare ſhould be amended in the ſtallion.

As for her age, ſhe may be covered when three years old; but the moſt convenient time is after four, when ſhe will

will nourifh her colt beft; and though fhe may breed till fhe is thirteen, yet fhe is not fit for it when fhe is paft ten, for the colt of an old mare is commonly heavy. Before a mare is covered, fhe fhould be in the houfe about fix weeks, during which time fhe fhould be well fed with good hay and oats well fifted; and in order to render her conception the more certain, near a quart of blood may be taken from each fide of her neck, about five or fix days before covering. Another method to bring a mare in feafon and make her retain, is to give her, for the fpace of eight days before you bring her to the horfe, about two quarts of hemp-feed in the morning, and as much at night; and if fhe refufes to eat it, to mingle it with a little bran or oats, or elfe to let her faft for a while: and if the ftallion alfo eat of it, it will greatly contribute to generation.

Mares go with foal eleven months and as many days as they are years old; and therefore the propereft time for covering them is in the beginning of June, that fhe may foal the May following, when there will be plenty of grafs, which will afford the mares a great abundance of milk for nourifhing their foals: but a mare fhould never be covered while fhe is bringing up her foal, becaufe the foal to which fhe is giving fuck, as well as that in her belly, will be prejudiced by it, and fhe herfelf fooner fpent. After covering, let her, for three weeks or a month, have the fame diet as before, and kept clean in the ftable till the middle of May, with her feet well pared and thin fhod: take her in again about the latter end of September, if not before, and keep her to the end of her foaling. If fhe cannot readily bring forth, hold her noftrils fo as to ftop her taking wind; and if that will not do, diffolve madder, to the quantity of a walnut, in a pint of ale, and give it her warm. In cafe fhe cannot void her fecundine, or after-burden, boil two or three handfuls of fennel in running water, then put half a pint of that liquor into as much fack, or, for want thereof, into a pint of ale, with a fourth part of fallad-oil, mixed together, and pour it luke-warm into her noftrils, holding them clofe for fome time: otherwife give her green wheat, or rye, the laft of which is beft.

If the mare has but little milk, boil as much as you can get from her, with the leaves of lavender and fpike, and bathe the udder with it warm, till the knobs and knots are diffolved. She fhould now drink only white water (which is bran put into water;) give her alfo fweet mafhes: and a month after foaling, let her have a mafh with fome brimftone or favin in it.

MARYGOLD, a flower much ufed as a pot-herb, and therefore planted in moft kitchen-gardens.

Marygolds are raifed from feeds fown in March or April, in the place where the plants are to remain. They require no other culture than keeping them clean from weeds, and thinning them to the diftance of about ten inches afunder, that their branches may have room to fpread. They will begin to bloffom in June, and continue in flower till the froft kills them. Their feeds will ripen in Auguft and September, and, if they are fuffered to fow themfelves, will produce a plentiful crop of young plants in the next fpring: but as thefe will confift of a mixture of good and bad forts, it is moft advifable to prevent this fpontaneous growth, to fave the feeds of the beft flowers only, and to fow each variety, whether fingle or double, by itfelf.

MARLE, a kind of dry, foft, foffile earth, ufed in manuring land.

Marle is either grey, blue, brown, yellow, red, or mixed, and is known by its pure and uncompounded nature: befides which, it is diftinguifhed by feveral other marks, fuch as, its breaking into little fquare bits; its falling eafily to pieces, by the force of a blow, or upon being expofed to the fun or froft; its feeling fat and unctuous; and its looking, when dry, after having been expofed to the weather for fome time, as if it was covered with a hoar-froft, or fprinkled with fine falt. Even when mixed with the land intended to be manured by it, the whole furface of the foil will have that whitifh appearance. But the moft unerring way to judge of marle, and know it from any other fubftance that may refemble it, is, to break a piece as big as a large nutmeg, and, when it is quite dry, drop it into a glafs of clear water, where, if it be the right fort, it will foon diffolve into a foft and almoft impalpable pap, fhooting up many fparkles to the furface of the water. Some marles effervefce but little with acids: but they fhould always be put to that trial; becaufe, the more they effervefce with them, the more valuable they are as manures. In hot weather, good marle will flake with the heat of the fun, like lime; efpecially if any rain follows a hot day.

The farmers in Staffordfhire reckon the foft blue marle, which is moft commonly found under clay, or low black ground, at the depth of feven or eight feet, the beft for arable land, and the grey fort the beft for pafture. That which is of a brownifh colour, with blue veins in it, and little lumps of chalk or lime-ftone, generally lying under ftiff clays, and very hard to dig, is moft efteemed in Chefhire. The marle which is ufually found at the depth of about two feet, or a yard, on the fides of hills, and in wet boggy grounds which have a light fand in them, is very fat and clofe, and reckoned the ftrongeft of all marles; for which reafon it is particularly good for fandy lands. This is commonly called peat-marle, or delving-marle. The paper-marle, as it is fometimes called, frequently lies near coals, and flakes like leaves or pieces of brown paper, than which it is of a fomewhat lighter colour. That which fome writers call clay-marle, becaufe it looks like clay, is very fat, and fometimes mixed with chalk-ftones. Steel-marle breaks of itfelf into fquare cubical bits. Thefe two laft kinds generally lie under fand or clay; fometimes about a yard deep under the former, but often much deeper under the latter.

Stone, flate, or flag-marle, which is a kind of foft ftone, or rather flate, of a blueifh colour, is generally allowed to be the beft. It eafily diffolves with froft or rain, is found near rivers and on the fides of hills, and is a very lafting manure. An ingenious gentleman, paffing lately through Bedfordfhire, obferved, that the people employed to mend the highways, were laying upon them a blueifh kind of ftone. Struck with the novelty of the appearance, he ftopt, took up a lump, and foon found it to be this blue marle, which the ignorant peafants were ufing inftead of real ftone. The confequence was, that, when he returned the fame way fome time after, a heavy fhower having fallen, the whole road where this fubftance had been fo injudicioufly fpread, was become a perfect quagmire.

Mr. Markham reckons four forts of marle, in Suffex; viz. grey, blue, yellow, and red. The blue is accounted the beft, the yellow next, and then the grey. The red is the leaft durable. A great deal of the marle in the north country runs much upon the loam; but that in Suffex is more like fuller's earth, and therefore muft certainly be the fatteft.

Mr. Mortimer fays, he faw a fample of marle from Derbyfhire, which was very fat, though it contained fo much fand, that, when wet, it could not be worked into a ball, or be made to hold together. This marle did very well upon clayey land, becaufe it was of an opening quality.

In many parts of moft counties in England, marle difcovers itfelf to the moft negligent eye; particularly on the fides of broken hills, or deep, hollow roads. Many rivers are bordered with a vaft treafure, which is plundered by every flood. Boggy lands frequently cover it; and, in them, it feldom lies above three feet deep. It is fomewhat lower under ftiff clays, and marfhy level grounds. The loweft parts of moft fandy lands abound with it, fometimes at the depth of three feet, and fometimes at feven, nine, or more. The depth of the marle itfelf can feldom be found; for, when the upper cruft of the earth is removed, all that can be feen, or dug, is marle, to fo great a depth, that there are few, if any, inftances of a marle-pit's having been exhaufted.

Nothing is more common than to find the ditches which inclofe a field, dug fo deep that they have penetrated fix or feven inches into a bed of marle, without the farmer's taking any notice of it; though the extraordinary fhooting and increafe of the grafs which is put forth by the marle thrown up on the fides of the bank, might, one would think, be a means of difcovering it. Where the marle is thus accidentally difclofed, it not only turfs the fides and tops of the banks, and thereby fecures them againft all injuries of the weather, but makes the grafs grow fo long and

thick,

thick, that, when beaten down by winds, it hangs as if it thatched the earth which nourished it, and carries off the rain, without letting any great quantity penetrate through it.

The marquis of Turbilly, in his excellent directions for clearing and breaking up land, recommends, for boring it (in order to know what different layers of earth, ores, quarries, springs, &c. lie underneath, and at what depth, by which means the better judgment may be formed of the plants most proper for the soil), an instrument of his own inventing, as far superior to any thing that has yet been thought of for that purpose. A description of it may be of service to every ingenious improver of land. *See the article* BORER.

Marle is very common in Ireland, where it seldom lies above a foot or two below the surface of the soil; luckily for that country, which is extremely boggy. But in France, though they have marle in many places, they are often obliged to dig for it very deep, particularly in the province of Artois, where it generally lies eighty or ninety feet under ground, in beds about five feet thick, at the bottom of which frequently is water, which breaks in upon the workmen. On account of this great depth of the marle-pits there, extraordinary care is taken to set up marks, and rail them in, to prevent the fatal accidents which might otherwise happen. The same is, indeed, done in England; but not so strictly as it ought to be.

Authors differ widely both as to the quantity and the manner of using almost all the manures they treat of; points which must, in a very great measure, depend on the quality of the soil, and the strength of the manure, of whatever kind it be, and in which experience will ever be the judicious farmer's surest guide. In marling, it is particularly necessary to find the true proportion which the land requires, and better to err in laying on too little, than too much; because, more may be added at pleasure; whereas, by over-doing it, the first year's crop often fails, because the body of the marle has not been sufficiently opened; and, in that case, it will sometimes be two or three years before the ground comes to a proper temper. The best directions that can be given to the farmer in the application of this manure to light soils, is, to lay on the quantity which will give the degree of cohesion wanted in those soils. A general rule cannot be laid down in this respect; because, the quantity of marle requisite to effect the desired end, must be different, in proportion to the degree of lightness of the soil.

Pliny speaks of marle as a species of improvement known to the Greeks, but more peculiar to Britain and Gaul. He calls it, the fat of the earth, and compares it to the glands in the human body, which are lapped in a coat of fat. As this manure, so far as we can find, was not used, and probably not to be found, in Italy, it shews how attentive the Romans were to agriculture, wherever they carried their victorious arms; since, notwithstanding the continual alarms they lived in from the natives here and in Gaul, they found time to discover and perfect a means of improving land, particularly suited to the soil and climate, and, of all others, the cheapest and most lasting.

Before we quit this subject, we must observe, with Dr. Home, that a body very similar to marle in its appearance, but essentially different in its effects, is often found in the same bed with the best marle. It is of a darkish lead-colour. Instead of fertilizing the earth, it renders even the best soils incapable of bearing any kind of vegetables for many after. I have seen, says that gentleman, the spots on which it was laid, entirely barren three years after; and have heard of its bad effects continuing in other places for a much longer time; nor is it certain when they will cease. A body so very destructive to agriculture, deserves to be well characterized, in order to its being shunned; and should be thoroughly examined, that we may know whence proceeds this noxious quality, and how to cure it when it has taken place.

Marle takes a smooth polish from the instrument with which it is wrought. A piece of this taken up, when it has not been much exposed to the influence of the air, differs greatly in taste from marle. Instead of the smooth unctuous taste of the latter, it is acid, and remarkably astringent. It agrees with marle, in crumbling in water, but differs remarkably from it in not raising any effervescence with acids, nor in the least destroying their acidity. It turns the syrup of violets red; which shews that it contains an acid: whereas marle, like all absorbent earth, gives it a green colour. The trying of marle with acids is therefore the more necessary, to guard against using this pernicious substance.

It appears from experiments made by the doctor, that this pernicious substance consists of an earthy body like clay, about an eighteenth part of salt of steel, and a small proportion of the vitriolic acid: from whence he concludes, that good marle is the proper cure where this noxious earth has been inadvertently used; because it corrects the acid, and decomposes the salt.

The following account of marle was sent by a very intelligent gentleman to the editors of the *Museum Rusticum.*

A short Dissertation on Marle.

It is taken out of the bowels of the earth at several depths, is of divers colours as after named, and some sorts have often two or three colours intermixed. It is unctuous, of a slippery nature, and in goodness pure; soon relents after rain, and, when dry, slackens like lime, and at last dissolves into the finest powder.

I intend to leave with you some specimens of two kinds of marle (which you may give to the gentlemen or farmers who desire them): they are what I have collected in Middlesex, which county abounds with good marle; but it is not used by the gentry, or farmers, so much as it ought, because they have so readily dung, soot, ashes, and other composts, from London.

In order to discover marle, the best way is to use the auger, and observe the strata taken up from time to time by it.

I have found, after I have got through the surface, which is about a spade and half deep, that the next earth was a very strong, coarse, bed of clay, five or six feet deep; afterwards, getting through it, the auger brought up marle, viz. that which appears of a fine light-brown colour, and some of it mixed with blue veins (which I will here call pigeon marle, by way of distinction): here was a bed of this pigeon marle of five or six foot deep, and after that followed another kind of marle, which I will call toad marle, by way of distinction; this is heavier, and without any veins of blue.

When either of these marles are dug out of the pit, the spade cuts them like so much soap; and the last-named marle looks very blackish and dark, and may be, and I believe is, in some countries, called toad marle, from its resemblance in colour to that animal; but this marle being exposed to the air alters the colour very much. This appears to me to be the strongest marle.

Marle may be discovered sometimes near the surface, by carefully observing the ditches and fences of your lands.

It is frequently found near rivers, or brooks, and sometimes may be discovered on the banks of such waters.

To know when you have found true Marle, try it by Air, Fire, and Water, or Vinegar.

First, By exposing a large lump of three or four pounds in the air, which, if true marle, will, in a little time, by the nitre, dews, &c. break into small parts; and there will be an hoary, or white, congelation on that part of it which is exposed to the sun.

Secondly, When your marle is dry, break it into small particles, and put an handful into an hot coal fire, and it will crackle as if so much salt had been put therein.

Thirdly, Place a piece of the dried marle in a glass, and thereon gently pour as much water as will cover it. If true marle, it will then gradually moulder, and dissolve into a liquid soap. Let not the glass be shaken, that you may observe the ebullition (which is material); or you may, in like manner, try it with vinegar, where the effervescence, or struggling, will be much stronger than in water.

The Virtues of Marle.

It is the beft manure for fandy, dry, gravelly, or light lands of any kind. It is excellent for moffy lands. It is, indeed, good for all other lands, of what nature foever, even clay, provided care be taken in laying on a proper quantity, and that the fame be well diffolved.

Care muft be taken in the quantity ufed; if too little, you may eafily add; but if too much is laid on the land, you cannot take it away.

It is ufed in fome countries for arable lands only: yet it is as good for grafs or pafture lands, but does not the firft, and feldom till the fecond year, fhew forth its utility; and then you will obferve the grafs to fhoot out a dark, or blackifh colour, which afterwards turns to the fineft green; and with it come up quantities of white clover-grafs, which hath occafioned me fome difficulty with the farmers to convince them I had not fown the clover-feed.

If lands are properly marled, they will continue good for twelve or fourteen years for the plough; and for pafture, or grafs-lands, much longer.

I would recommend that the plough be not fuffered to enter into the land till the marle is thoroughly diffolved.

Fifh thrive prodigioufly, and grow fatter in marle-pits than any other ponds.

Quantities to be ufed.

A great difficulty this to afcertain the quantity.

In fome countries they will tell you of laying three hundred loads to an acre, others more, others lefs; but they no where afcertain what is a load. In Chefhire and Lancafhire their loads are fcarcely fix bufhels, and they ufe a fmall cart made for the purpofe, drawn by two or three fmall horfes.

If the land is gravelly, fandy, or light, let as much be laid on it as will make a good thick coat to bind and ftiffen the foil.

But let the land be what it will, fo much fhould, in all events, be laid on as will make a thin coat over the entire furface.

Upon my lands, which are grafs and pafture, of a tolerable mould, on a clayey foil, and which were left, about eight years fince, in a bad plight, by the late tenant, I firft attempted to lay ten loads to every acre, (by a load I mean as much as three large, well-fed, ftrong horfes could draw) but found it was too little, and would not meet in the fpreading.

I immediately doubled the quantity, and two years afterwards I added another coat of fifteen loads more to every acre, and find it anfwers very well for hay and pafture. I need not fay horfes and cows are fonder of this hay and grafs than of that wherein the dung may be tafted and fmelt.

A work of this kind fhould be fet about by the end of Auguft, or beginning of September; and the loads fhould be fhot into fmall heaps, as the Middlefex farmers fhoot their dung, viz. two or three bufhels in each heap; and a man muft be ready to feparate it, that the nitre, air, dews, and rain, coming on the large pieces, may act, and caufe them to break, as of themfelves, into fmaller parts.

After the marle has been laid upon the ground, and you fee that the air, nitre, &c. have loofened the great lumps, and they are ready, on a flight touch, to fall into pieces, a perfon fhould be ordered (when the weather and marle are quite dry) to break and fpread the pieces to complete your coat; and you fhould avoid as much as poffible, leaving any large pieces to lie and diffolve without being fpread on the furface, but caufe them to unite therewith.

In the beginning of February, and in dry weather, I caufe an old gate to be well bufhed, and a heavy weight laid on it, to be drawn by one horfe over the whole field, in order that every part may have its due proportion.

If you intend to plough your lands, the preceding cautions are not fo neceffary, as the plough and harrows will fpread and intermix the marle with the foil fufficiently; but if you ufe the drill-plough, the above hints may be ufeful.

It would take a volume to give an exact and full hiftory of marle, its virtues and ufes, and to fhew that it was ufed by the Romans, and many years difcontinued, and efpecially till the houfes of York and Lancafter were united, and then revived in fome few counties; and the great benefits received by marling in Suffolk and Norfolk within a few years paft.

We very well know that gentlemen and farmers are a long while ere they care to venture on the practice of marling from theory, and principally from not having feen or known what is, and what is not, true and genuine marle, and from being unacquainted with the rules or modes to judge and determine upon it: therefore, if this fhort account will obviate their doubts, and in any way contribute to the advancement of agriculture, vegetation, and pafturage, my defign is anfwered.

There are variety of colours in marle, viz. blue, white, yellow, red, and other colours, which make no material difference, provided they be earthy and fat, or flippery as foap, and as free as poffible from a mixtre of fand, gravel, or ftone.

DICE MARLE, a name given by the people of Staffordfhire to a reddifh marle, that breaks into fmall fquare pieces like dice, or into thin flakes, in the manner of lead ore, and looks fmooth on the furface.

MARSHY LANDS, a fort of pafture or grazing grounds, lying near the fea, rivers, or fens.

As to lands lying near rivers, the great improvement of them is their being overflowed, which brings the foil of the uplands upon them, fo that they need no other mending, though kept conftantly mowed. The great inconveniency of thefe lands is their being fubject to floods, which high hills near the fides of rivers, and the long courfe of them, befpeak to be frequent: and, though the richeft land generally lies near fuch rivers, yet there is the greateft danger of the crops being fpoiled, efpecially when they are not inclofed, and therefore cannot be fed with cattle. This, when feeding bears any thing of a price, would be the very beft way of managing thefe uncertain lands; and inclofing them would be highly beneficial on this account. *Mortimer's Hufbandry.*

The marfh-lands in Lincolnfhire, and many other parts of England, produce a fort of grafs, which feed fheep in a bettter manner than that of almoft any other land, in regard to their fize, and the quantity of wool. The fheep about Grimfby, and fome other places in this county, produce fuch lufty wool, or, as they call it, wool of fo large a ftaple, that three or four fleeces ufually make a tod of twenty-eight pounds weight. Several hundred loads of this wool are yearly carried from thefe places to Norfolk, Suffolk, and other parts of the kingdom, for the cloth manufacturers. They fend this in large packs, which they call pockets, each containing about five and twenty hundred weight. *Philof. Tranf.* Numb. 223.

When marfh lands lie flat, it is neceffary for the owner to keep all the water he can from them. The fea-water in particular is to be kept from them as much as poffible; and this is ufually done at a very great expence, by high banks and walls.

Two things greatly wanting in thefe lands, in general, are good fhelter for the cattle, and frefh water. The careful farmer may, however, in a great meafure obviate thefe, by digging in proper places, large ponds to receive the rain water, and by planting trees and hedges in certain places towards the fea, where they may not only afford fhelter for the cattle, but keep off the fea breezes, which often will cut off the tops of all the grafs in thefe places, and make it look as if mowed.

Thefe lands fatten cattle the fooneft of any, and they preferve fheep from the rot. It would be of great advantage to them, if there were raifed, in the middle of every large marfh, banks of earth in a crofs, or in the form of two femi-circles, and thefe planted with trees; thefe would ferve as a fhelter for cattle, let the wind blow from what quarter it would, and would foon repay the expence of making.

There are, in different parts of England, very large quantities of land upon the fea-coafts that would be worth taking in, though no one has yet thought of doing it. The coafts about Bofton, Spalding, and many other parts of Lincolnfhire, give frequent inftances of this, where the ſea falls from the land, ſo that on the outſide of the ſea walls, on the owſe, where every tide the ſalt water comes, there grows a great deal of good graſs, and the owſe is firm to ride upon when the water is upon it.

This owſe, when taken in, hardly ſinks any thing at all, and they dig the walls from the outſide of it, all the earth they are made of being taken from thence, and the ſea, in a few tides, filling it up again: and though the ſea, at high water, comes only to the foot of the bank, yet once in a year or two, ſome extraordinary tides go over the banks, though they are ten feet high. Theſe banks are fifty feet broad at the bottom, and three feet at the top; and the common price of making them is three ſhillings a pole, the earth being all carried in wheel-barrows, and face towards the ſea, where the greateſt ſlope is, being turfed. *Mortimer's Huſbandry.*

MATFELLON. *See* BLUE BOTTLE.

MAY-WEED, a wild ſpecies of chamomile, a trailing pyrennial plant, which puts out roots from its branches as they lie on the ground. By this means, and by ſcattering its ſeeds long before the corn is ripe, it ſpreads and multiplies greatly. It flowers in May, and thence has acquired the name of May-weed.

The means of extirpating it are, ſummer fallows, repeated good harrowing, and burning the collected roots, as before directed, in ſimilar caſes, or, which will be found ſtill more effectual, the frequent hoeings practiſed in the New Huſbandry. What eſcapes theſe clearings ſhould be very carefully pulled up by hand; for the common weeding-hook will not go deep enough to take out the whole of the long ſlender tap root of this plant, of which every remaining bit that has a knot in it will produce new ſhoots. Nor ought the farmer to regret this ſmall additional expence, to get rid of one of the moſt fatal enemies his corn can have. Mr. Liſle aſſures us, that as good a crop of wheat as one would wiſh to ſee all the winter time was, to his knowledge, ſo deſtroyed by the coming up of May-weeds and poppies in the ſpring and ſummer, that it did not at laſt yield ſo much as the ſeed.

MEAD, a liquor made of honey, and held in great eſtimation by moſt of the northern nations, but perhaps not eſteemed here ſo much as it might deſerve, if due care was taken to prepare it properly.

All the writers who have hitherto treated of this ſubject, have given into a capital error with regard to the ſtrength of this liquor, by directing too great a proportion of honey to be diſſolved in the water. The uſual practice of making it ſo ſtrong to bear an egg, is very wrong. The liquor is thereby rendered a meer ſtum, and this bad quality is ſtill increaſed by the long boiling generally practiſed. It is ſcarcely poſſible to procure honey ſo pure, but that ſome bee-bread, wax, or other ſubſtance, is mixed with it; and this cannot be perfectly ſeparated from it, ſo far as I know, but by boiling. On this account the boiling of mead ſeems indiſputably neceſſary. In order the more effectually to ſeparate theſe impurities from the liquor, it will be adviſable to mix ſome whites of eggs with it before it is put on the fire, and it will be particularly neceſſary to ſkim off the thick ſcum that riſes, the moment the liquor begins to boil; and this muſt be attentively continued ſo long as it boils. The only intention of boiling being here to ſeparate the impurities, and to make a perfect union of the water and the honey, both which purpoſes are very ſoon obtained, it evidently appears, that the boiling need be of but very ſhort duration. This becomes here more particularly neceſſary, becauſe the liquor will be the leſs diſpoſed to ferment kindly, the longer the boiling has been continued. It is perhaps owing to the ſingle article of long boiling, that mead has hitherto lain under ſo great diſcredit; becauſe it then never fermented ſufficiently to take off its luſcious ſweetneſs; whereas, had it undergone a due fermentation, that ſweetneſs would have gone off, and the mead would have attained a fine racy flavour.

Some notable houſewives have added hops to their mead. This helps to take off its ſweetneſs, and, as the bitterneſs of the hop goes off, gives it a pleaſant flavour. A ferment is here, as in all liquors that are boiled, generally wanted to bring on a perfect fermentation: but as the leaſt taint in the ferment is communicated to the whole liquor, particular care ſhould be taken that it be very ſweet and good. Mead, judiciouſly managed on theſe principles, will keep for years, and be improved by age. The racking, fining, &c. of this liquor, are the ſame as thoſe of other white wines.

MEADOW, a general name for paſture or graſs-lands, annually mown for hay; but is more particularly applied to lands which are ſo low as to be too moiſt for cattle to graze upon them in winter, without breaking the ſward.

Meadows, being generally enriched with the fine mould waſhed down from the adjacent riſing grounds, are uſually of a good ſoil, and ſeldom require any other improvement, than the removing of temporary imperfections. But they may likewiſe be of ſuch a nature as to ſtand in need of a more particular treatment: as is the caſe when their ſurface is a moſſy looſe earth, or when it is of a binding or clayey quality.

If, through long neglect, a coarſe ſtrong graſs, ruſhes, or other buſhy plants, be ſuffered to remain upon the ground till they rot there, they will, in ſome years, form a looſe ſpongy ſubſtance, ſomewhat reſembling moſs. In this caſe, the firſt neceſſary ſtep is to pare off and burn that looſe ſurface, or at leaſt ſo much of it as to enable the plough afterwards to reach the better ſoil underneath. The manner of doing this has already been explained ſo very amply, that it will be ſufficient to add here, that this looſe upper earth muſt be ſo ſtrengthened as to afford ſufficient ſtability to the roots of whatever plants are ſown on it, by mixing it well, either with the better ſoil underneath, or with marle, clay, or rich loam, brought to it from the neighbouring grounds, or with the compoſts before directed for this purpoſe.

If the ſoil is clay, or a ſtrong binding earth, the treatment of it is much the ſame, whether it be meadow or upland paſture. Such ſoils, by retaining water in every hollow place, become what the farmers call ſour, and produce a coarſe graſs, compoſed, as Mr. Miller obſerves, of bad weeds, of which the ſeveral ſorts of docks make no ſmall ſhare. Although many of the meadows produce a great burden of what the country people call hay, yet this is fit only for ſuch cattle as, by hard labour and hunger, are driven to eat it: for horſes which have been accuſtomed to feed on good hay, will almoſt ſtarve rather than touch this. A plain proof of its being diſagreeable to all cattle, is, that when they are turned in, after it has been mowed, we often ſee the ground covered with rank weeds, which they will not meddle with.

When a paſture is in the ſtate above deſcribed, if there is a ſufficient depth of ſoil to admit of it, the ſurface ſhould be pared off, and burnt: and as ſuch places are uſually over-run with ant-hills, theſe ſhould alſo be burnt; after which, by the addition of proper manure, and by the help of deep plowing, the land ſhould be brought into fine tilth. The deeper this improvement goes, the deeper and more laſting will the graſs be. We have been informed of a particular inſtance of the good effects of this method, by which the gentleman who practiſed it had graſs which continued for years in a ſtrong ſtate of vegetation, and was conſtantly near a month forwarder than that of his neighbours, whoſe ſoil and ſituation were exactly the ſame.

Let not any one be deterred by the expence attending this improvement: for the crops of grain and other plants taken while the ſoil is thus preparing, will nearly repay all the charges, and the ground will afterwards yield much more plentiful crops of graſs; at leaſt for a number of years. But as clayey lands require more frequent and more thorough repairs than other ſoils, the returns of tillage propoſed by Camillo Tarello will be the moſt proper means of managing them.

He would have farmers divide their paſtures in four parts, keep one of theſe parts under grain or pulſe, during five years, and at the expiration of that time lay it down to graſs as before; and ſo proceed with every other part. He propoſes, that the firſt breaking up ſhould be by paring and burning, and thorough plowing. But if we may differ from him in opinion, we think it is needleſs to keep the ground ſo many years in tillage, unleſs this ſhould ſuit the huſbandman's convenience for the culture of particular plants.

plants. In this cafe, the pafture may be divided into five or fix parts. After each part has thus been in tillage, Tarello advifes breaking up again the fpot firft began with; though not by burning now, but only by plowing, in order to fow it as before. "This, fays, he, will be profitable to the hufbandman, and improve the pafture. It will benefit the hufbandman, becaufe he will thereby raife a greater quantity of corn; and it will do good to the paftures, becaufe nothing is more ferviceable to them, than this renewal of their furface, as is attefted by Columella. Let not the hufbandman imagine that he will have lefs hay when only three fourths of his ufual extent of land are under grafs: for, in fact, it is not the quantity of the land, but the care which is taken of it, that gives plenty of hay."

When a foil of this kind is laid down for meadow, great care fhould be taken to flope it down gently, from the middle, in fuch manner that no water may reft on any part of it. If the extent is large, fmall ditches fhould interfect the meadow into as many divifions as fhall be neceffary to form a fufficient drain for the wafte water, and the fpaces between thefe ditches may be gently raifed. In an upland pafture on fuch a foil, ridges fhould be raifed inclining a little from the horizontal, that the furrows may be fo many drains, as before directed in the plowing of fuch foils, to prevent their becoming fpewy or wet: for as the rain cannot defcend beyond the clay, it will glide along it, till, collected in fuch quantities as to form a fmall ftream, it iffues forth at the furface, ufually loaded with fome mineral quality imbibed from the earth underneath.

When the foil is a rich or light loam, the plough will not be fo neceffary; as fuch meadows or paftures may be repaired by the means which will be pointed out in the directions hereafter given for the improvement of the meadows already laid down to grafs. *See the article* GRASS *and* PASTURE.

Black, rich mould, requires but a moderate quantity of water: juft fufficient to give action to the fertilizing particles it contains. The watering here fhould be frequently repeated, rather than long continued.

It is a general rule, that fandy or gravelly foils require watering the moft of any; becaufe whatever moifture they receive, finks through them too fpeedily. But it may be doubted, whether this very reafon for watering them be not one of the greateft of objections againft their being watered, at leaft fo much as is generally directed: for the water not only paffes rapidly through thefe foils, but it may carry down with it through the fand or gravel, the finer and richer particles of the fhallow mould ufually found upon fuch foils, and thereby rather impoverifh their furface. It would therefore feem advifable, to let water in upon fuch foils only occafionally, to refrefh their verdure, when their furface is too dry: and to give it a pretty quick current, that it may reach to a greater extent of furface: for if it runs flow, it finks too faft.

It is a queftion whether paftures newly laid down to grafs, after having been arable land, ought to be watered at all during the firft year. The judicious author of one of the ingenious differtations in the Memoirs of the Berne Society confulted on this fubject an intelligent farmer, who had experienced the effects of watering, and of not watering, thefe new paftures, as fome call them, and was anfwered; that they had yielded the greateft quantity of grafs the firft year, when they had been watered, but that the crops had always dwindled in the fucceeding years: whereas thofe that were left dry till autumn, and then only begun to be watered, had made ample amends during the following years, for the fcantinefs of their produce in the firft. This hufbandman was therefore of opinion, that it is beft not to water thefe meadows before the autumn; and he added a farther very fenfible reafon, namely, that as thefe new meadows ftill retain fome portion of the manure laid upon the land the year before, when it was fowed with corn; the letting in of water upon them, while the mould is yet extremely loofe and light, will be apt to carry off thofe rich remains of manure, which will otherwife incorporate with the foil, as it acquires more confiftence.

A very wrong cuftom which prevails among our farmers, in general, with refpect to low meadows, is, that of flowing them during the whole winter. The roots of all the fweeteft kinds of graffes are thereby deftroyed, and only fuch left as are natives of marfhes, which are coarfe and four, and which no cattle will eat.

The method which Mr. Miller propofes for the management of thefe meadows, is never to flow them till the middle or latter end of March, excepting once or twice in the winter, when fuch floods happen, as bring down a great deal of foil from the upper lands: for then it will be of great fervice to let fuch water in upon the meadows, that the foil may fettle there: but the fooner the wet is drained off after this is lodged, the greater will be the benefit done to the meadows. By letting on the water frequently, from the end of March to the middle of May, the growth of the grafs will be greatly affifted, and there will not then be any danger of deftroying its roots.

River water, which is univerfally acknowledged to be the beft for this purpofe, cannot be fo beneficial when the ftream overflows its banks, and runs rapidly over the paftures, as when its courfe is flow; and ftill much lefs than when it ftagnates. It therefore is advifable to fence in every meadow liable to be thus overflowed, in fuch manner that it cannot be flooded, but at the owner's pleafure, by opening proper fluices. But as the produce of many meadows will not bear this expence, the proprietor, or farmer, fhould, if poffible, prevent the too hafty current of the water, by raifing at their upper end, or wherever elfe it may be neceffary, fuch fences as fhall render the water which flows fidewife upon the meadow, rather a back, or ftanding water. Great advantages will arife therefrom. The finer mould will no longer be carried away by the ftrong current of the river, which, inftead of robbing the foil, will then depofit a rich fediment, and thereby greatly fertilize the land.

The water of mineral fprings fhould not by any means be brought upon paftures; becaufe they are either deftructive of grafs, or produce only a very harfh coarfe kind of it.

We fhall clofe this fubject with the following remarks made by the judicious author of one of the before-mentioned differtations in the Memoirs of the Berne Society, and which deferve the ferious attention of every hufbandman who would water his paftures with due care.

"Many people imagine, that the whole art of watering meadows confifts in making good channels, and in opening and fhutting the fluices at proper times. But this is not enough: for fo long as the water flows in a meadow, the farmer fhould vifit all his channels once or twice a day, with a fhovel, hoe, or three grained fork in his hand, and examine carefully whether any of them want cleanfing or repairing. Sometimes he will find a channel choaked with flime; in other places he will fee the water fpread too far, or not far enough; and in others again he will obferve it not rife high enough to overflow its channel, fo that the neighbouring ground is not watered at all. He will immediately endeavour to remedy thefe defects, according to the exigency of the cafe, whether by clearing away the muddy flime, heightening the banks of the channel, lowering them, giving a freer current to the water in fome places, and checking its courfe in others, according to the nature of the foil; or by cutting new channels in fome places, and laying fods or fluices acrofs others, to divert the ftream from fuch parts as are fufficiently moift, and turn it to others which want watering: for it frequently happens that, even in the fame meadow, though not a large one, there are very different foils, each of which requires the affiftance of water, but in different degrees. In fhort, the careful hufbandman will not ever vifit his paftures without noticing in them things which may be altered and amended."

The farmer who has improved his meadows according to the foregoing directions, may expect abundant recompence in plentiful crops of grafs.

When grafs is to be fed off, it fhould not be permitted to ftand till it grows high, becaufe the cattle will then trample under foot great part of it, which they afterwards will not eat. The prudent hufbandman will alfo vary the kinds of cattle fed upon it. *See the article* HAY.

MEDLER, a fpecies of fruit-trees, and may be raifed by grafting or budding them upon the common white thorn. This is the ufual way of propagating the American forts, which are of the hawthorn kind; but the beft way to raife the other forts is from their feeds. All medlars and will take when they are grafted or budded upon each other. They will alſo take upon ſtocks of pears, or of quinces, and both of theſe will take upon the medlar; ſo that there is a great affinity between them. All the American ſorts will grow twenty feet high, if they are not ſtinted by grafting.

Medlars may alſo be raiſed from their ſeeds, which, if put into the ground in autumn, ſoon after they are ripe, will come up the following ſpring: but if they are not ſet till the next year, they will not ſhoot till the year after.

MELILOT, a plant of the trefoil kind, and grows in ſuch abundance among the corn in many parts of England, particularly in Cambridgeſhire, as to be a moſt troubleſome weed; for it is hardly poſſible to ſeparate it from the corn in reaping, ſo that they are houſed together, and the ſeeds of the melilot, which ripen about the ſame time as the corn, are threſhed out with it, after which, they being likewiſe heavy, it is very difficult to ſeparate them. If but a few of theſe ſeeds are ground with the corn, they will ſpoil the flour; for the bread, or whatever elſe is made with it, will have a ſtrong taſte and ſmell like melilot plaiſter. The roots of this plant are ſtrong and woody, and from them ſpring out ſeveral ſtalks, which riſe from two to four feet high, according to the goodneſs of the land. Theſe ſtalks branch out, and are garniſhed with trifoliate leaves, having oval ſawed lobes of a deep green colour. The flowers are produced in long ſlender ſpikes, which ſpring from the wings of the ſtalks. They are of a bright yellow, ſhaped like the other butterfly flowers, and are ſucceeded by naked ſeeds, which ripen in Auguſt.

MELON, the name of a well-known plant cultivated in kitchen-gardens.

To have a continuation of melons, they ſhould be ſown at two, or rather three, different times. The firſt, if the ſeaſon be forward, ſhould be in the ſecond week in March; but otherwiſe it will be better to defer it for a few days longer; becauſe the ſucceſs of theſe plants depends greatly on their being raiſed ſtrong, which they cannot well be if the weather ſhould prove ſo bad after they are come up, that a ſufficient quantity of freſh air cannot be admitted to them. The ſecond ſowing ſhould be at the end of March; and the third, if there be a third, ſhould be about the tenth or twelfth of April. Theſe are the directions of Mr. Philip Miller, whoſe long experience and excellent obſervations have enabled him to treat this ſubject ſo much better than any other had ever done before him, that we cannot do juſtice to him, or to our readers, but by giving the ſubſtance of his judicious inſtructions on this head; eſpecially as they contain ſeveral new and eſſential improvements.

The melons which beſt deſerve culture are, the Cantaleupe, the Romana, the Succado, the Zatte, the ſmall Portugal, and the black Galloway: for our common ſorts, and thoſe which moſt of the trading gardeners around this metropolis raiſe for the markets, where their ſize is chiefly regarded, are not worth the trouble and expence beſtowed upon them, otherwiſe than as they bring in a profit to the cultivator.

The Cantaleupe, as it is called, by way of pre-eminence, particularly by the Dutch, who cultivate very few other ſorts, and never ſubjoin the word melon when they ſpeak of this, though they apply that diſtinctive appellation to every other kind, is held in the greateſt eſteem by all the curious in Europe. It derives its name from a place (where the pope has a country-ſeat) about fourteen miles from Rome, where it has long been cultivated: but it was firſt brought thither from that part of Armenia which borders on Perſia, where this fruit grows naturally in vaſt abundance. Its outer-coat is very rough, full of knots and wart-like protuberances; and its fleſh, which is generally of an orange colour, though it is green in ſome, but theſe are not ſo good, is ſingularly delicious, when in perfection, and remarkable for the ſafety with which it may be eaten; for it does not offend even the moſt tender ſtomachs.

The Romana is a good melon, when it is well conditioned, and produced by a perfectly healthy plant, in a dry ſeaſon. It may be ripened ſooner than the Cantaleupe, and therefore merits the attention of thoſe who are fond of having early melons.

The Succado is alſo a very good ſort, and will yield early fruit: but neither it, nor the Romana, can be compared to the Cantaleupe, when this laſt is in ſeaſon.

The Zatte melon is likewiſe well taſted; but its fruit is ſo very ſmall (ſeldom exceeding the ſize of an orange), and the fleſh in it ſo little, that it is ſcarcely worth cultivation. It is ſomewhat flat at both ends, and its coat is warted like that of the Cantaleupe.

The ſmall Portugal melon, which ſome call the Dormer melon, may alſo be cultivated for an early crop. It is a pretty good fruit, and grows plentifully; for which reaſon people who chooſe quantity rather than quality, and many whoſe palates are not nice, give it a ſort of preference to moſt other ſorts: but it falls greatly ſhort of the Cantaleupe, in point of flavour.

The black Galloway, which was brought from Portugal, many years ago, by Lord Galloway, is the beſt of all melons for an early crop; for it will ripen in a ſhorter time from the ſetting of it, than any other ſort; and its fruit is by no means bad when it is ſuffered to ripen naturally. This would, therefore, certainly be a very proper ſort to cultivate even in the open field, according to the principles of the New Huſbandry, by a proper application of which to the melon, we have juſt ſeen how well M. de Chateauvieux ſucceeded. The ſeeds of the right black Galloway are, indeed, not eaſily met with now in this country; becauſe it has degenerated by growing among other ſorts, the male duſt (farina) of whoſe bloſſoms has been waſted to, and has impregnated, the flowers of this: for, to preſerve any particular ſort of melon in perfection, no other plant of a different kind, though of the ſame genus, no cucumber, no gourd, nor any ſimilar growth, ſhould be permitted to blow near it.

To the want of care in this important, though too generally unheeded, caution, is owing the complaint of many lovers of this fruit, who, not knowing the true cauſe, have imputed the gradual diminution of the goodneſs of their melons to their having been too long cultivated from ſeeds ſaved in the ſame garden, and have therefore held it to be abſolutely neceſſary to procure a frequent change of ſeeds from diſtant parts. That a change of ſeeds now and then is beneficial, and even adviſable, is readily allowed in regard to this, as well as for all other vegetables; but the great difficulty is, to get them from people who have ſaved them with due care; for all hired, or otherwiſe mercenary, gardeners, are apt to be very blameably negligent in this reſpect. Even Mr. Miller, though a member of the botanic Academy at Florence, and very ſolicitous to have the right ſort, could not, for ſeveral years, procure any good ſeeds of the true Cantaleupe melon, notwithſtanding that ſeveral parcels were ſent to him from Italy, as ſuch, by perſons who, he thought, could not be deceived in their choice, and who lived near the place of their growth. He therefore judiciouſly warns all perſons not to depend upon ſeeds brought from abroad, either by thoſe who import them for ſale, or by gentlemen; and declares his own reſolution, founded on repeated diſappointments to be, never more to try any of them, unleſs he receives them from a ſkilful perſon who has himſelf eaten of the fruit from which he ſaved them: "for, adds he, in Italy, Spain, Portugal, and many parts of France, the gardeners are very careleſs in the choice of all their ſeeds, but of the melons they are remarkably ſo; and as for thoſe which come from Conſtantinople, Aleppo, and other parts of Turky, I have rarely ſeen one melon produced from thoſe ſeeds, which was tolerable."

Melon ſeeds ſhould be at leaſt three years old, and not more than ſix, or at moſt ſeven, when they are ſown: for though they will grow at the age of ten or twelve years, and at leſs than three, yet the fruit produced by them will, like that of light ſeeds which ſwim upon the water when taken out of the pulp, not be near ſo thick fleſhed, ſo firm, ſo moiſt, or ſo well taſted, as what is raiſed from heavy ſeeds kept to a proper time, even though they be taken out of the ſame melons. Mr. Miller has made the trial ſeveral times, and always found this to be the event. The culture of all ſorts of melons, of which there are many varieties beſides the above-mentioned, though not of value enough to be particulariſed here, is exactly the ſame. The two firſt ſowings of them, that is to ſay, thoſe made in March, ſhould be under frames, and therefore

fore these may be placed at the upper side of a cucumber-bed, if there be one in readiness; otherwise a hot-bed must be made on purpose for them, with new horse-dung, in the manner before directed for cucumbers, like which they are to be raised and managed in all respects, till they are planted out where they are to remain. The third sowing, of which the plants are generally reared under bell or hand-glasses, or under frames covered with oiled paper, should not be earlier than the tenth or twelfth of April, lest these plants, if they thrive well, should extend their shoots to the sides of the glasses before it will be safe to let them run out, on account of the sharp morning frosts which are frequent in this country even in the middle of May: nor must they, on the other hand, be cramped in the glasses, because they would then be in equal danger from the heat of the sun in the day-time. If they do grow so as to exceed the limits of their glasses sooner than it may be safe to expose them to the air, the projecting ends of their vines must, in that case, be sheltered with mats, to defend them from the cold. For these reasons it is most advisable to set the seeds of such plants as are to be reared under hand-glasses, a little later than those which are intended for the much more spacious coverings of oiled paper: and likewise for the same reasons, it is best in this climate, not to attempt to have melons ripe earlier than the middle of June, from which time they may be had in plenty till the end of September, if they are rightly managed: nay, when the autumn has continued favourable, Mr. Miller has had them very good, even till the end of October.

When the beds, or, as the gardeners term them, the ridges, in which these plants are to be set to remain, are of a proper warmth (but not before, lest the too great violence of the heat at first should burn the earth laid upon them) a covering of two inches thick of mould will be sufficient to begin with, except in the middle of each light, where a hill of it should be raised eighteen inches high, or more, terminating in a flat cone, in the top of which the plants are to be placed. In two or three days, this will be sufficiently warmed to receive the plants, which always succeed best when they are transplanted young; and the most proper time for removing them is the evening, when a little wind is stirring. They should be carefully taken up with a trowel, so as to preserve all their fibres, and as much earth as possible about them; for these plants are much tenderer than those of cucumbers. The Cantaleupe melon is particularly so: for it will be long before that recovers itself, and after being transplanted, if this is not done soon after it has put out its third, or what the gardeners call its rough leaf. If this happens before the beds are ready, the best way is, particularly for the Cantaleupe, which requires the nicest management, to take up the plants, as soon as they are fit for removing, to put each of them into a separate small garden pot, and then to plunge these into the hot bed where they were raised, or into a cucumber bed, if there be room, in order that they may be brought forward; and when the bed or ridge where they are to remain is ready, they may be turned out of the pots, with all the earth about their roots, so as not to receive any check by the transplanting. This may be the more easily done, as only one melon plant should be suffered to grow in each light, and there will not be any danger of hurting their roots when they are removed in this way. When they are well placed on the top of the little mounts, or hillocks, before mentioned, they should be watered gently, and this should be repeated once or twice, till they have taken good root, after which more water will seldom be wanted, or advisable; because too much wet makes them canker at the root, and then they never produce good fruit. When the plants are well fixed in this new bed, a greater quantity of earth should be laid on it, beginning at the hillocks, that their roots may be enabled to strike out horizontally; and as this earth is added from time to time, it should be pressed or trodden down as close as possible, till it is at last raised at least a foot and a half thick upon the dung all over the bed. The frames should also be raised in proportion, that their glasses may not be so near the plants, as to make the sun scorch them: but in this raising of the frames, great care must be taken to stop every crevice all around, so that no cold air may be able to penetrate through them.

The earth, which the Dutch and German gardeners, who are very exact in that respect, lay upon these beds, consists of one third of hazel loam, one third of the scouring of ponds or ditches, and one third of very rotten dung. They prepare this compost at least one year, but oftener two years, before they use it; frequently turning it during that time, the more thoroughly to blend and sweeten it: but Mr. Miller has found, by experience, that melons succeed best in this country, when they are planted in two thirds of fresh gentle loam, and one third of rotten neats dung, well mixed, and frequently turned over during one year before they are wanted, so as to enable them to enjoy all the benefit of a winter's frost and summer's heat; and of this a sufficient heap should always be kept in readiness, under a shed, well sheltered from heavy rains, which would carry off its goodness.

When the plants have four leaves, and consequently a joint, their tops above that joint should be pinched off with the finger and thumb, to make them put out lateral branches, for these are to produce the fruit; and when there are two or three of these branches, their extremities must also be pinched off, as soon as they have got two or three joints, to force out more, and these again must be treated in the same manner, that there may be runners enough, as the gardeners call them, to cover the bed. Care must be taken not to bruise the plants, when the tips of their shoots are thus pinched off, nor must they be cut with a knife, because the wound will not heal soon in either of these cases. Neither should a greater number of lateral shoots than is necessary to cover the bed properly, be forced out by cropping off their ends, lest more fruit should be produced than the plant can possibly nourish. The farther management of these plants is the same as that of cucumbers, only it is to be observed, that melons require a greater share of air than cucumbers, and very little water; and that when they are watered, it should always be at a distance from their stems.

If the plants raised in frames succeed well, their vines will extend over the bed, and reach to the frames, in about six weeks, at the end of which the alleys between the beds should be dug up; or, if there is but one bed, a trench about four feet wide should be dug on each side of it, as deep as the bottom of the bed. A sufficient quantity of hot dung should then be trodden down closely to it, till this dung is as high as that of the bed, and this additional breadth should be covered with the same sort of earth as was used for the bed. This earth should also be trodden down as close as possible, and the whole bed should by these means be enlarged to the breadth of twelve feet; for the roots of the plants will extend themselves to very near that distance: but if they should reach farther than they are covered, and their extremities be consequently dried by the sun and air, the plants themselves will gradually languish and decay, or at best produce but meagre, mealy, and ill flavoured fruit; whereas those which have a sufficient breadth and depth of well trodden earth for their roots to run in, will remain in vigour till the frost destroy them. Mr. Miller has experienced the benefit of this practice, so far as to have a second crop, even of Cantaleupe melons, upon the same vines as had borne the first; and that second crop has sometimes ripened very well under his judicious inspection. The languishing of the plants, for want of sufficient room to extend their roots, frequently before the fruit is full grown, and even sometimes before it is well formed, may soon be discovered by the drooping of their leaves in the middle of the day, and a then speedy total decay of many of those leaves. It is owing to their not having enlarged the beds, as above directed, or even made them at all wider than they were at first, or increased the original depth of the mould upon them, which perhaps did not exceed the common allowance of about three inches, that many people have seen their plants of Cantaleupe melons pine away, and perish, before they had ripened a single fruit; and then have imputed to their tenderness, too great, say they, for this climade, a miscarriage which was entirely owing to their not understanding the right method of cultivating them.

When the vines have extended so far as to fill the frames, and consequently to want more room, the frames should be raised up about three inches above the surface of the

the bed, and ſet upon a few bricks, at that height, in order that the ſhoots may have room to run out under them: for if the plants are vigorous, theſe branches will reach to the diſtance of ſix or ſeven feet every way from their ſtem. It therefore is evidently beſt, not to put more than one plant under each light; and the more ſo as its fruit will ſeldom ſet well if the vines are crowded, but will drop off when about the bigneſs of an egg. The addition of the warm dung before mentioned, on each ſide of the bed, will indeed, by reviving the heat of the dung in the bed, be of great ſervice to the ſetting of the fruit, eſpecially if the ſeaſon ſhould prove cold, as it ſometimes is with us till the very end of May; and this is ſurely no ſmall advantage accruing from that method. To ſecond it properly, the frames for melons ſhould not be made ſo ſmall as is the general cuſtom; for the wider they are, the better the plants will thrive, and the greater quantity of fruit they will produce.

If the weather ſhould become cold after the plants have extended themſelves from under the frames, it will be right to cover the extremities of their vines every night with mats, during the continuance of the cold; for if they are injured, the growth of the fruit will be retarded, and the plants themſelves may be hurt eſſentially. Care ſhould alſo be taken after this enlargement of the beds, that what water is given to the plants be poured only in the alleys between the beds, or towards the outſide of the ſpace added to them; for their roots will now have extended ſo far as to reap the benefit of any ſuch watering, and their ſtems will continue the ſounder for being kept dry.

This watering ſhould be pretty plentiful when it is given; but it ſhould not be repeated above once a week, even in the drieſt weather: and, on the other hand, the plants ſhould be aired as much as poſſible when the ſeaſon is warm.

The plants of melons intended to be reared under bell or hand-glaſſes, ſhould be raiſed in the ſame manner as the beforementioned; and the beds, or ridges, for them ſhould be made by the latter end of April, if the ſeaſon is forward. A ſufficient quantity of hot dung ſhould therefore be provided for this purpoſe, ſo as to allow eight or nine good wheel-barrow loads of it to each glaſs. When there is but one bed, and that is to be extended in length, the trench for it ſhould be dug four feet wide, and its length ſhould be proportioned to the intended number of glaſſes, which ſhould ſtand at leaſt four feet aſunder: for if the plants are too cloſe to each other, their vines will intermix and entangle, and crowd the bed ſo as to prevent the ſetting of the fruit. This trench ſhould be ſo ſituated, that there may be room for widening the bed two or three feet on each ſide. Its depth muſt depend on the nature of the ſoil, as was before obſerved: but if the ground is ſo dry as to obviate all danger of the bed's being hurt by wet, it cannot well be dug too deep. After the dung is ſpread, trodden down, and flatted in the trench, as already directed, a hill of earth (ſuch as was before adviſed will be the beſt) ſhould be raiſed eighteen inches high, with a flat head, in the middle of each ſpot where a plant is to be ſet; but the reſt of the bed need not yet be covered above four inches thick; for that will be ſufficient to prevent the evaporation of the warmth of the dung. The glaſſes ſhould then be ſet down cloſe, over the hills, that theſe may be warmed ſo as to be fit to receive the plants, which they will be in two or three days, if the bed works kindly, and then the plants ſhould be ſet in the top of the hills, in the manner before directed. If they are taken out of pots, with all the earth about their roots, only one ſhould be ſet under each glaſs, becauſe there will not then be any danger of their growing; but if they are tranſplanted directly from the ſeedling-bed, it will be right to plant two upon each hill, and afterwards to remove one of them, if they both grow. Theſe plants muſt be watered when they are firſt ſet, to bring the earth the cloſer to their roots. They muſt alſo be ſhaded every day, till they have taken new root; and if the nights prove cold, the glaſſes ſhould be covered with mats, the better to preſerve the warmth of the bed.

When ſeveral of theſe beds are made, they ſhould ſtand eight feet aſunder at firſt, that there may be between them a proper ſpace, which is afterwards to be filled up, in order to enlarge them ſo that the roots of the vines may have room to extend themſelves every way, for the reaſons before aſſigned.

When theſe plants have taken good root, their tops muſt be pinched off as before directed for thoſe in the frames; and the glaſſes ſhould be raiſed up in the day time, in warm weather, on the ſide oppoſite to the wind, to let in freſh air to the plants, which will otherwiſe be drawn up weak and ſickly: a ſtate which all poſſible care ſhould be taken to prevent, becauſe their runners cannot ſupply the fruit with due nouriſhment, if they themſelves have not proper ſtrength.

If the weather be favourable, the glaſſes ſhould be raiſed two or three inches high from the ſurface of the beds, and ſet upon three bricks, as ſoon as the plants are grown long enough to touch their ſides, in order to give the vines room to run out from under them; but it is eſſential to obſerve, that, when this is done, the whole bed ſhould be covered with earth to the depth of eighteen inches; that this earth ſhould be trodden down as cloſe as poſſible; and that, if the nights ſhould prove froſty, a covering of mats ſhould be carefully ſpread over the beds, to guard the tender ſhoots of the plants from the cold. It is alſo to be obſerved, with regard to the Cantaleupe melon in particular, that, as the vines of this ſort cannot endure wet, the beds where it grows ſhould be arched over with hoops, to ſupport the mats, and that theſe ſhould be held in readineſs to be uſed at a moment's warning, either againſt cold or rain: for this is the only way to have theſe melons ſucceed in ſo variable a climate as ours is. Mr. Miller gives a ſtriking inſtance of the neceſſity of this precaution, when he ſays, that he had ſome beds of Cantaleupe melons in as fine order as could be deſired, under theſe glaſſes, and that they were totally deſtroyed by one day's heavy rain in June.

If the weather ſhould prove cold after the bed is covered with the proper thickneſs of earth, well trodden down, it will be adviſable to dig a trench along each ſide of it, or, if there are more beds than one, to dig out their intermediate ſpace, then to fill this, or the trenches, with hot dung, up to the height of the dung of the adjoining bed, and to cover this dung with an equal depth of well trodden down earth, as before directed. This new dung will revive the warmth of the former beds, and ſoon make the plants ſhew their fruit. The watering of them, pinching off their tops, and, in ſhort, every other part of their management, muſt be the ſame as before directed for thoſe under frames: but a farther care requiſite here is, to cover them with mats in all hard rains and cold nights. If all this is rightly performed, theſe plants will remain vigorous until the cold in autumn deſtroys them.

The oiled paper coverings are a late invention; but they have been found to ſucceed admirably well when rightly managed. The chief thing to be attended to when they are uſed, is, not to keep them down too cloſe over the plants; for then the melon vines will waſte themſelves by running out in length, and will be ſo weak as rarely to ſet their fruit in any plenty. The beſt way therefore is, where theſe coverings are intended to be uſed, to raiſe the plants under bell or hand glaſſes, as before directed, till they are grown large enough to be releaſed from thoſe glaſſes; and then, inſtead of mats, to uſe this oiled paper covering, which, if it be prudently managed, will anſwer every end that can be deſired.

To make this covering, a number of ſheets of ſtrong, but not too dark coloured, paper ſhould be paſted together ſo as to over-ſpread the frame intended to be uſed; and theſe ſhould then be faſtened to the frame, and rubbed well over with linſeed oil, which will dry ſoon; for all the ſtench ſhould be gone off before it is put over the plants, becauſe they will otherwiſe be hurt thereby. Pan-tile laths put together in the ſhape of the ridge of a houſe, with hinges to each ſlope, whereby any of the pannels may be raiſed at pleaſure, to let air in to the plants, are the beſt materials, and the beſt form, for theſe frames; for when they are made with broad hoops, like the tilts of waggons, they are cumberſome to move, and no air can be admitted to the plants, but by raiſing up one whole ſide of the frame; which is very inconvenient.

When the vines begin to put forth their fruit, which they will do in plenty ſoon after the bearing runners ſhall have been produced by nipping off, in the manner before adviſed, firſt the top of the plant, as ſoon as it has one joint, and then the ends of the earlieſt lateral ſhoots when they have two or three joints, they ſhould be carefully looked over thrice a week, to obſerve the ſetting of the young melons, and ſingle out, upon each runner, that only which ſeems to be the ſtrongeſt fruit, which has the thickeſt foot-ſtalk, and which is ſituated neareſt to the ſtem. All the others ſhould then be pinched off; and the end of the runner upon which a melon has been thus choſen ſhould alſo then be nipped off at the third joint above the ſelected fruit, to ſtop the ſap and ſet the melon: but none of the ends of theſe bearing runners ſhould ever be broken off before the particular fruit has been culled out, becauſe that would only make them produce more ſhoots, which would weaken the plant, and draw away the nouriſhment neceſſary for the fruit. For this reaſon, if any new ſhoots do break out, or any young fruit appears, after the above precautions in favour of that which is intended to remain have been taken, they ſhould be nipped off immediately; for if many of them are ſuffered to grow, they will abſolutely impoveriſh the plant to ſuch a degree, that it would not be ſurprizing to ſee all the fruit drop off when it comes to be about as big as a man's thumb. One young melon is as much as ought to be left upon any one runner; for, if but half of theſe ſtand, they will be full as many as the plant can nouriſh. Six or eight of the Cantaleupe's, whoſe fleſh is thick, are full enough for the ſtrongeſt plant of that kind; and though ſome ſmaller ſorts may be ripened in greater numbers, even unto fifteen or twenty upon one plant, they will be thinner and poorer than if they were leſs numerous.

For plants which are ſo confined under frames, that the wind requiſite to convey the farina from the male flowers to the female is excluded, it is the practice of ſeveral gardeners, and perhaps it may there be even a neceſſary one, to take off ſome of the male flowers whoſe farina is juſt ripe and fit for the purpoſe, and, inverting them over the female flowers ſituated on the crown of the young fruit, to ſtrike the former gently with the tip of a finger, ſo as to ſhake its farina into the latter; for by this means the female flower will almoſt ſurely be impregnated, and if it is, its fruit will ſwell ſoon after, and ſhew manifeſt ſigns of being perfectly ſet: but, from the time that the fruit appears on the vines, the glaſſes ſhould be conſtantly taken off in good weather, or the fruit will ſeldom form in any plenty.

As the melons draw towards ripening, (long before which all the ſuperfluous fruit and weak runners will have been pinched off, if they are properly managed,) they ſhould be turned gently twice a week, that every part of them may receive equal benefit from the ſun and air; for if the ſame ſide is ſuffered to lie continually downward, in which ſituation it will be deprived of both thoſe advantages, that ſide will become pale, or whitiſh, as if it were blanched.

Beſides airing the plants as much as poſſible when the weather will permit, they will alſo require to be watered in very dry weather, and perhaps moſt particularly after they have been pruned: but this, as was before obſerved, ſhould be done with great care not to wet their ſtems, by pouring the water only in the alleys, at a diſtance from them: nor ſhould it be repeated oftener than once in a week or ten days. Then, indeed, the alleys ſhould be well ſoaked, to forward the growth of the fruit, and render it thick fleſhed: though it is eſſentially neceſſary not to over-water the plants.

The goodneſs of all melons depends greatly on their being cut at a proper degree of maturity. The Cantaleupe, in particular, is ſo very nice in this reſpect, that it will loſe much of its delicacy if it be left but a few hours too long upon the vines. The beds ſhould therefore be looked over at leaſt twice every day when the fruit is ripening; and if thoſe which are intended for the table are cut early in the morning, before the ſun has warmed them, and laid by in a cool place till they are uſed, their flavour will be much better than if they are gathered later in the day, and ſerved up directly. Such as are cut afterwards, when the heat of the day has affected them, ſhould be put into a pail of cold ſpring water, or ice, to cool them, before they are ſet upon the table.

A ſure ſign of maturity in the Cantaleupe melon is, its beginning to crack at the foot-ſtalk, and to emit a fragrant ſmell. Whenever this happens, the fruit ſhould be cut directly; for this ſort ſeldom changes its colour as the others do, and only a few hours delay will render it too ripe, as was before obſerved.

The beſt ſeeds of melons are thoſe which are taken from the firmeſt and higheſt flavoured fruit; and if they are ſcooped out with the entire pulp, ſo as not to diſplace them, and left in it for two or three days before they are waſhed out, they will be benefited thereby. None but the heavy ſeeds, which ſink in the water, are worth ſaving. *Miller's Gard. Dict.*

MESLIN-CORN, wheat and rye mixed together.

MET, a ſtrike, or four pecks.

METEYARD, or METERWARD, a ſtaff of a certain length for taking meaſures.

MIDDING, a dunghill.

MIDGE, a knat.

MILDEW, a diſtemper very deſtructive to corn.

"This diſtemper, ſays M. Duhamel, attacks the blades and ſtems of corn, which it covers with a powder of the colour of ruſt of iron, when at the height of their vegetation. This ſubſtance does not adhere ſtrongly to the blades; for I have ſeen the hair of white ſpaniels full of this powder, after they have run through a field attacked with this diſeaſe. It is likewiſe known, that if the infected wheat is waſhed by a plentiful rain, the ruſt diſappears almoſt entirely, and the grain ſuffers little from it. The French give it the name of ruſt, from the colour of the powder; and it ſeems to be the ſame diſtemper which the Roman writers call *rubigo*.

"The cauſe of this diſtemper is uſually imputed to dry gloomy weather, happening while the corn is at the height of its vegetation: and in effect I have many times obſerved, that when a hot ſun has ſucceeded ſuch dry hazy weather, the corn was ruſted within a few days after.

"This diſtemper is not common in clear and dry hot years: but when the ſpring is wet, the fineſt fields of wheat run great hazard of being deſtroyed by the mildew, which generally appears upon the breaking out of the ſun in the morning, after cloſe and ſultry weather, during which there has not been any dew. The ruſty powder then gathers upon the blades in ſuch quantities as to cover the earth two feet around. M. de Chateauvieux cut off the mildewed blades, and found the trial anſwer: the ſame plants produced new blades, and throve much better than thoſe on which this operation had not been performed: but this cannot be done except when the corn is very young.

"This diſtemper is very fatal: for the fineſt wheat is ſuddenly brought almoſt to nothing, when it is entirely attacked with it.

"If it attacks the plants while they are young, and before their ſtems begin to riſe, the miſchief is ſometimes not very great, provided there comes on a ſeaſon favourable to their farther growth. In this caſe, they are only weakened, as if they had been fed or mowed. They ſhoot out anew, and produce ears: though their ſtraw is ſhorter, and thoſe ears are ſmaller, than they would otherwiſe have been. But if both blades and ſtalks are mildewed at the ſame time, the farther growth of the plant is ſtopt, and the grain gets ſcarce any more nouriſhment; ſo that the crop is exceedingly diminiſhed.

"This grievous diſtemper well deſerves the ſerious attention of every inquirer into nature, who intereſts himſelf in the progreſs of agriculture; and I cannot too ſtrongly exhort all ſuch, to endeavour to inveſtigate its cauſes and remedies.

"Several authors have, very improperly, confounded this diſtemper with others to which corn is ſubject. M. Tillet imputes it to a ſharpneſs in the air in dry cloudy weather, which breaks the veſſels interwoven with the ſubſtance of the blades and ſtem, and makes them diſcharge a thick oily juice, which, drying by degrees, is turned into that ruſty powder. In effect, if we examine with a microſcope, or only with a good magnifying-glaſs, plants of wheat, whoſe ſtems and leaves are covered with ruſt, we ſhall ſee diſtinctly ſmall crevices in the places where this powder lies, and ſhall diſcern, from ſpace to ſpace, in the membrane of the plant, openings through which it ſeems probable that the juices, afterwards converted into this ruſty powder, iſſues, and over which one may perceive ſome ſlight fragments of the membrane imperfectly covering thoſe cracks and openings.

"In

" In ſupport of this opinion, M. Tillet quotes a memoir of M. de Renéaume, publiſhed in the Tranſactions of the Academy of Sciences, on the extravaſation of the nutritive juice of the walnut trees in Dauphiny: of the manna of Calabria, which is not a dew, but the extravaſated juice of the leaves of a kind of aſh; and what M. Muſchenbroek relates in his Phyſical Eſſays of thick and oily juices which iſſue out at the excretory veſſels of leaves, and ſtop there in the conſiſtence of honey.

" However this may be, the ruſt of corn is the conſequence of a diſtemper of which the firſt cauſe is not yet ſufficiently known. It is a miſtake to think, that the ruſt and mealy powder which may be ſeen on many plants are a collection of eggs laid there by inſects, and that this is a ſource of other innumerable inſects very fatal to vegetables. By admitting the extravaſation of the nutritive juices, as the cauſe of theſe diſtempers, we ſhall conceive that the ruſt of corn, the honey-dew, the mealy-dew, and all the unctuous ſubſtances which are found upon gramineous plants, depend on the quality of the juice concentrated in the plants, upon the outſide of which it manifeſts itſelf by evaporation, and is converted ſometimes into an impalpable powder, and ſometimes into that thick ſubſtance which is red on garden-beans, of a ruſty colour on all kinds of corn, greeniſh on the plum-tree, yellowiſh on the aſh, white on the larch-tree, &c.

" Theſe obſervations and reflections ſtill leave undoubtedly much room to wiſh for farther information. They will, however, help to point out the path to a careful obſerver, and ought to excite philoſophers to exert themſelves in a matter of ſo great importance to the public. We confeſs that we have tried to produce the ſame effects as the dry hazy weather, which occaſions the ruſt, by applying to the leaves of many plants, acid and corroſive liquors, to others alkaline or ſpirituous, and frequently ſuch clammy glutinous ſubſtances as might ſtop the perſpiration without hurting the texture of the plants: but none of theſe trials have produced any thing like ruſt. However, who can tell how far experiments may lead the judicious and attentive? Some little circumſtances which may have eſcaped us, might perhaps, if duly remarked, have led us to the object of our ſearch. The public welfare calls on all attentive obſervers, to exert themſelves on this very intereſting ſubject.

" Count Ginanni, in a memoir printed in the *Journal Economique*, for October 1761, treats expreſsly of this diſtemper, and ſays, he has obſerved, with the help of a microſcope, ſmall worms lodged between the two membranes of the blades.

" If we had any certain knowledge of the cauſes of the ruſt, we ſhould probably be enabled the more eaſily to find preſervatives againſt it: but in the mean time it will be right to collect every obſervation made by lovers of agriculture; becauſe they will certainly afford uſeful lights at one time or other.

" M. de Chateauvieux obſerved, in the autumns of 1753 and 1754, that when the corn was ruſted, the ſecond crop of hay was ſo likewiſe. The graſs turned from a fine green, to the ugly ruſty colour of the corn: it was covered with the ſame kind of powder, and its quantity diminiſhed ſenſibly every day; and as the whole of a field of corn is not uſually affected at the ſame time, ſo this diſtemper extended only to ſome parts of the meadow.

" The cauſe of this diſtemper is undoubtedly the ſame in corn and in graſs; but its effect is not exactly ſimilar. It may deſtroy annual plants, ſuch as corn, entirely; but in perennials, like graſs, it deſtroys only the leaves or blades. May not the preſervation of theſe laſt be owing to the taking off of thoſe leaves or blades, when they are cut for hay? But this is only conjecture; for I own that I have not yet made any obſervation on this head.

" As the ſtraw of ſmutty, mildewed, or ruſted corn, and by the ſame rule graſs, in a ſimilar condition, may poſſibly give diſeaſes to cattle fed with it; it were to be wiſhed, for the public good, that a parcel of fodder, the moſt infected with either of theſe diſtempers, ſhould be ſet apart for the food of a certain number of beaſts. If cows or oxen, for example, remain ſound and healthy after having been fed with this growth for two or three months, we may afterwards give it them with confidence and ſafety: but if, on the contrary, they are viſibly diſordered by it, the remedy is eaſy and at hand, by feeding them with good wholeſome hay, which will carry off the diſeaſe, then known to proceed from the bad quality of the food."

The air in England ſeldom is ſo dry as to exhale all the moiſture of the glutinous exſudations, and thereby convert them into the ruſty powder above deſcribed. The extravaſation of the ſap ſeems to account for this diſtemper of plants in a much more rational manner, than the thick clammy dews which ſome of our authors ſpeak of, as falling in cloſe weather, ſtopping the perſpiration of vegetables, and hindering their juices from aſcending to nouriſh the flowers, &c.

Mr. Miller takes the true cauſe of the mildew's appearing moſt upon plants which are expoſed to the eaſt, to proceed from a dry temperature in the air when the wind blows from that point; in which caſe it ſtops the pores of plants, and prevents their perſpiration, whereby their juices are concreted upon the ſurface of their leaves; and that concretion being of a ſweetiſh nature, inſects are incited thereto. Thoſe inſects, finding their proper nutriment, depoſit their eggs, and multiply ſo faſt as to cover the whole ſurfaces of plants, and, by corroding their veſſels, prevent the motions of the ſap. He thinks it very probable, that the excrements of theſe inſects may enter the veſſels of plants; and, by mixing with their juices, may ſpread the infection all over them; for it is obſervable, that whenever a tree has been greatly infected by this mildew, it ſeldom recovers in two or three years, and many times never is entirely clear from it after. But he by no means allows theſe inſects to be the firſt cauſe of this diſtemper, as ſome have miſtakenly imagined.

It is obſervable, that mildews and blights frequently attack only one ſort of corn, or fruit, and leave the other ſpecies unhurt.

Count Ginanni diſtingiſhes two principle kinds of mildew, one of which ſpots the blades and ſtems of corn, and dries upon them, without ever producing any powder; but penetrates through their outward covering, and entirely dries them up. This is generally of a pale colour, either reddiſh, yellowiſh, purpliſh, or blackiſh; and ſometimes a variegated mixture of many colours. The other ſpeedily covers the plant with a moiſt and thickiſh ſubſtance, which afterwards becomes dry, and turns into a powder, of one or other of the abovementioned colours, but moſt commonly reddiſh or yellowiſh. This, ſays he, always fades, corrodes, and ſeparates the outer ſkin from the plant. The former extends to every ſpecies of corn; but the latter is almoſt peculiar to wheat in the blade; though it is ſometimes ſeen upon oats and barley. Some may perhaps reckon, as a third ſpecies of mildew, a yellowiſh ſubſtance, or powder, ſometimes ſeen under the membrane of the blades of corn, where it raiſes bliſters, makes many little holes and craks, and corrodes the fibres; and perhaps they may not be wrong in accounting it ſuch.

He is confident that this diſtemper is the rubigo of the Latins.

" For the vegetation of ſeeds," continues count Ginanni, " after they have been properly depoſited in the earth, for their fecundity, their ſprouting, and the increaſe and well-doing of the plants produced by them, it is neceſſary that the action of the fluid which pervades them be duly regulated: for that fluid is operated on in them by the ſame cauſes which affect the liquor in a thermometer and barometer, or influence the hygrometer; ſo that whenever its due courſe is obſtructed or weakened, or its quantity too much increaſed or diminiſhed, or its quality injured in any manner whatever, a diſtemper will enſue. This fluid is ſubject to two laws of motion; the one, ſimply as a fluid, which conſiſts in an inteſtine agitation of its minuteſt particles; and the other, as a fluid whoſe progreſs is through the various ducts of the plant. By the firſt of theſe motions it aſſimilates to itſelf all the homogeneous particles, and expels the heterogeneous; and by the ſecond, it penetrates into the various parts where thoſe functions are to be performed. When both theſe motions proceed naturally, equally, and juſtly, the ſecretions are duly made, and every part of the plant continues ſound and healthy: but when that harmony is interrupted, the fluid degenerates from its natural ſtate, and the ſecretion becomes vitiated and depraved.

"Now, if the ſeveral diſtempers to which plants are ſubject are owing to the various ways in which the regular action of this fluid may be hurt; and no one diſtemper can, in my opinion, happen to corn, which will not fall under one or other of theſe circumſtances; we ought to ſearch after, and endeavour to diſcover them, in order to be thereby enabled to prevent, or to cure them, that mankind may be the leſs expoſed to the injuries reſulting therefrom. But as the knowledge of theſe particular things depends on an adequate conception of thoſe which are univerſal; and as the univerſal cauſes of diſtempers are external or internal, and the diſtempers themſelves ſeem particularly to depend on the conſtitution of the air, or an alteration of food, or on both; ſo when we have diſcovered the genus of the cauſe, it will not be very difficult afterwards to find out the ſpecies, and the efficient cauſe. So many and various have been my reſearches, obſervations, and experiments, and ſuch the lights which they have afforded me, that, if the love of truth did not oblige me to be diffident of myſelf, and if I was not thoroughly perſuaded, with that great philoſopher and mathematician Gallileo, that we cannot in general underſtand how nature acts, becauſe ſhe makes uſe of means frequently beyond the reach of our comprehenſion, I ſhould, perhaps, flatter myſelf with thoughts of having diſcovered the origin of ſome of the diſtempers to which corn is ſubject whilſt in the blade."

He then gives his opinion of mildews, which is, that they come on very early in the morning, and cover the corn almoſt inſtantaneouſly, after a cold night, which has been preceded by a hot day; and that the ſap or moiſture which then iſſues out of the plant, is gradually exhaled, and forms the ruſty powder which characteriſes this diſtemper.

After trying in vain all the boaſted remedies of the ancients (highly commended by ſeveral modern writers) ſuch as burning of ſtraw and weeds in a ſerene night, when not a breath of air is ſtirring, or the wind, if any does blow, comes only from the weſt, ſticking up branches of laurel, &c. ſprinkling the corn with tobacco, and with pepper; and ſtrewing among it, as Dr. Hales adviſes, woollen rags ſteeped in a ſtrong ſolution of ſalt of tartar, or ſea-ſalt, or in good white-wine vinegar, and afterwards well dried, even from which laſt he cannot ſay that he has found much benefit; the method long ago directed in this caſe by Mr. Worlidge, of making two men go at a proper diſtance from each other in the furrows, holding a cord ſtretched ſtrait between them, and carried ſo as to ſhake off the dew from the tops of the corn, before the heat of the ſun has thickened it, ſucceeded beſt of all; to which he adds, as an excellent preſervative, keeping the ground perfectly free from weeds, and ſtirring the earth frequently between the plants. I ought not to omit here M. Worlidge's farther obſervation, that "the ſowing of wheat early has been eſteemed, and doubtleſs is, the beſt remedy againſt mildews; for by this means the corn will be well filled in the ear before thoſe dews fall, and the increaſe will conſequently be the greater. For curioſity ſake, wheat was ſowed in all the months of the year: that ſown in July produced ſuch an increaſe as is almoſt incredible. In France, they generally ſow before Michaelmas.

"Bearded wheat is not ſo ſubject to mildews as the other, its awns keeping the dew from the ear."

MILKNESS, a dairy. *See* DAIRY.

MILLET, the name of a plant which grows naturally in India, from whence it was firſt imported into Europe, is greatly cultivated in Italy, Spain, and the ſouthern parts of France, for the food of men, as well as for that of poultry: and we alſo raiſe it in ſeveral places in England; though we have our annual ſupply of this grain from the Eaſt-Indies, which makes ſome people erroneouſly call it Eaſt-India wheat.

It delights in a light ſandy ſoil, prepared in the ſame manner as for maize; and in ſuch land it branches out into many ſtalks, ſometimes thirty or forty, not unlike reeds either in their ſhape or leaves, of which there is one at each joint. The top of each ſtalk is terminated by a large looſe panicle, which hangs on one ſide, with a chaffy flower, which is ſucceeded by a ſmall round ſeed, about the bigneſs of turnip or cabbage-ſeed, of a yellowiſh white colour in one ſort, and of a dark red, inclining to black, in another. The ſmall millet, and the large, a diſtinction which ſome writers make, are only varieties of the ſame ſort. It is likewiſe ſaid to thrive extremely well in ſtrong land: but will not do in ſtony ground, or where the bottom is either chalk or clay.

Mr. Miller directs ſowing this grain in the beginning of April, which may be very right in this country, that it may be ripe in Auguſt: but in warmer climates, the general rule is to ſow it either between the middle and the end of May, or at Midſummer. The former is reaped at the end of September, and the latter about the end of October.

The ſeed is ſowed in furrows, very thin, and covered with the plough or rake. The largeſt ſort ſhould be ſowed thinneſt, becauſe it branches moſt. When the plants are about a month old, the ground ſhould be ſtirred round them with a hand-hoe, as well to lay freſh earth to their roots, for they require a great deal of nouriſhment, as to clear them from weeds, of which they will afterwards prevent any great increaſe, by over-topping them. At the ſame time, the millet ſhould be thinned wherever it grows too cloſe, ſo as to leave, in general, about ſix inches between each plant. The huſbandman has nothing more to do to this grain till harveſt, exceptiug that, when it begins to ripen, he muſt take great care to protect it from birds, which would otherwiſe ſoon devour it. If preſerved from them, the returns are very great; for it is not eaſily hurt by drought or rain, nor is it ſubject to blight. Frequent ſhowers of rain are of great ſervice to it whilſt growing.

When the millet is ripe, its panicles are cut off near the uppermoſt joint of the ſtalk, with a knife, and put into baſkets or ſacks, in which they are carried home. They are then laid up in heaps, covered over with cloths, and, after remaining in that ſituation five or ſix days, are ſpread upon the barn floor, threſhed out with a flail, and cleanſed, like other grain. Great care muſt be taken to dry it well in the ſun, before it is laid up in the granary: for it would ſoon ſpoil if the leaſt moiſture were left in it; this being of all grains the moſt difficult to keep, unleſs it be thoroughly dry: and, on the other hand, none keeps longer or better, after it has been well dried. It is not liable to the weevil: and though it ſhould be turned from time to time in the granary, yet if that happens now and then to be neglected, it ſtill keeps perfectly well.

It has been a conſtant obſervation, that the late ſown millet, I mean ſo late as Midſummer, had always had the greateſt number of abortive grains; that its panicles are ſmaller than thoſe of the ſame grain ſowed earlier; and that the crop is leſs plentiful.

The ſmall white millet, which is by far the moſt delicate, and of which excellent puddings, &c. are made, is the ſort chiefly cultivated in this country. The red, which is much larger and coarſer, is not uſed here, except, perhaps, for pigeons, poultry, and ſwine, for which laſt it ſhould be ground to meal: but the peaſants about Bourdeaux, where a great deal of it is raiſed in the poor light lands near that city, make of it a reddiſh, heavy, ill-taſted bread, difficult to digeſt. The culture of this ſort, which is Mr. Miller's *ſorgum*, is, in all reſpects, the ſame as that of the white; excepting that, as it grows much larger, the plants require more room.

Millet, either green, or after its grain is threſhed out, is very good fodder for cattle, for which uſe it may be ſowed thicker than for a crop of grain. Its many roots, large ſize, and quick growth, are ſaid to render it a great impoveriſher of the earth; for which reaſon ſome people pull up the roots, and plough the ground immediately, as ſoon as the crop is reaped: but others, more judicious, plough in the ſtubble and roots, which rot, and greatly enrich the ſoil: and indeed all other ſucculent plants, inſtead of being ſuch robbers as is commonly ſuppoſed, return to the earth, by the inſpiration of their leaves and perſpiration of their roots, even while they grow, perhaps as much as they borrow from it: for how ſhould it be poſſible for them to pierce into the very drieſt and hardeſt ground, as we frequently ſee they do, unleſs they perſpire moiſture through their roots? As this plant requires a great deal of nouriſhment, it would probably thrive beſt in the horſe-hoeing huſbandry.

The

The following account of the culture and amazing produce of the African millet, was fent by the ingenious Mr. Burton, to the editors of the Mufeum Rufticum.

" I cannot help mentioning to you, for the fake of your practical readers, the African millet, *forghum, milium nigrum*, the culture of which is ftrongly recommended by M. Tfchiffeli, who has written a paper on the fubject, publifhed in the Tranfactions of the Berne Society. There is fomething fo very extraordinary in this paper, that I am fure you will think a fhort abftract of it worthy to be inferted in your work.

" Monf. Tfchiffeli obferves, that this millet is a plant which merits the hufbandman's utmoft attention, and that for the following reafons: 1. It thrives in all forts of foils. 2. It neither requires much dung, nor a great deal of tillage. 3. It is not fubject to the depredations of birds, which are very fond of panic and common millet. 4. It yields very large returns. 5. Laftly, it does not exhauft the land in proportion to the largenefs of the crops.

" He farther fays, that the feed of this fort of millet comes originally from Africa, where it fupplies the inhabitants with food; but that they are miftaken who thence conclude it will thrive only in hot countries: for providence has endowed it with fuch excellent qualities, that it may, with fuccefs, be cultivated in countries much colder than Switzerland.

The firft feed of it M. Tfchiffeli received was from Mr. Engel, magiftrate of Efchalens, who procured it from Pomerania, it being fent to him by the celebrated doctor Schreber, in the fpring of the year 1760. M. Tfchiffeli had from him about a fpoonful.

" In the month of May of the fame year, he fowed it on a gravelly foil, hard and ftony, very much expofed to the north wind, and which the year before had borne fome very indifferent bere. In the month of February preceding, fome human ordure had been laid on this land; and in May the clods were all broken before the feed was fpread: having fo fmall a quantity of feed, he took care to fpread it very thin; and to this does he afcribe the ftalks running to the height of eight feet or more. The ears were above ten inches long; and if a fhower of hail had not fallen on it, the fpoonful would probably have produced him at leaft a peck. This accident occafioned the lofs of half his feed: he had, however, enough left to divide with his friends in Switzerland, as well as elfewhere.

" In the month of May, 1761, he fowed about a quart of feed, or near a pound, on fome land, from which he had firft pared off the turf, and afterwards burnt it. The fpace on which the feed was fown might be about twenty paces long, and ten broad.

" Some time before harveft, M. Tfchiffeli perceived he fhould have allotted three times as much ground for that quantity of feed. The ftalks, which were very clofe, were interwoven one with the other, like the hairs of a brufh. They were fcarcely five feet in height, and the ears alfo were much fhorter than the preceding year: this, however, did not prevent his reaping about feven pecks, or above fifty for one. In the year 1762, he fowed about four pounds of feed, or about half a peck, on fome pretty good land, being in quantity about thirty fquare rods or perches. The year before, the fame land bore potatoes; and as he had laid on no frefh manure for the millet, and had neglected to plough it before the winter (for it was only turned over with a fpade before fowing) he imagined he had not fown the feed too thick: but in this he was greatly miftaken; the millet came up almoft as thick as the year before, and as he had not the courage to thin it, which would have been right, the ftalks and ears were fhorter than the firft year.

" Notwithftanding this, he was enabled to reap twenty bufhels, being fix hundred and forty pounds; of courfe, a return of an hundred and fixty for one.

" There can then be no reafon to doubt, but that land of a moderate quality, fown thin, and properly prepared, will produce, one year with another, one hundred bufhels of millet per acre; for our hufbandman got as much in proportion, though his land was but flightly tilled, and he manifeftly fowed his feed too thick. This is certainly a moft wonderful increafe, in what light foever we behold it.

" What grain is there which in the open field will yield a return of one hundred and fifty for one, and which, at the fame time, will fell fo well, for in price it is on a footing with wheat? It is true, it yields a heavy, crumbly, and indifferent bread; but if it is made into pottage, it is excellent, very nourifhing, and of exquifite flavour. Not only M. Tfchiffeli's fervants and workmen were very fond of millet thus prepared; but he himfelf prefers it to the beft rice, which will not grow in Switzerland, and comes at a much higher price.

" The millers in Switzerland, whofe reputation is not of the beft, return a good third of a bufhel of millet-meal for every bufhel fent to them, after deducting toll, bran, wafte, &c. Now this ingenious writer knows by experience, that fuch a quantity, when made into pottage with milk, will ferve at leaft fifty men for a meal. Surely they cannot be fed at a cheaper rate. In times of fcarcity millet muft be of great ufe, as with potatoes the poor might live comfortably.

" An acre of land requires, at moft, but ten pounds of feed; and M. Tfchiffeli fays he can, from his own experience, venture to affert, that millet does not impoverifh land in proportion to its produce. The land he fowed in 1760 and 1761, yielded, the following year, fine plants of Dutch clover, and rye-grafs in as great plenty, with refpect to the crops, as the neighbouring land."

MILL-HOLMS, watery places about mill-dams.

MISLIN, the fame with maflin, or maflin-corn. *See* MASLIN-CORN.

MINT, the name of a well-known herb, propagated in the kitchen-garden.

There are feveral fpecies of mint; but all of them are very eafily propagated by parting the roots in the fpring, or by fetting cuttings of it during any of the fummer months, in a moift foil. If the feafon fhould prove dry, thefe cuttings muft be watered often till they have taken root, and after that they will not require any farther trouble, except good weeding. If any quantity of thefe plants is raifed (for example, for diftilling) they fhould be fet in beds about four feet wide, with a path a foot and a half or two feet broad, to go between the beds, in order to water, weed, and cut the mint; and the diftance between the plants fhould be at leaft five inches every way, that their roots may have room to fpread; for this they do to fo great a degree, that they will mat together, and rot each other, if they are fuffered to ftand above three years in the fame bed.

When mint is cut for diftilling, or for any medicinal ufe, this fhould be done in very dry weather, when the plants are juft coming into full bloom; for they are fulleft of fap, and higheft in flavour, at that point of time. What is then cut fhould be hung up to dry in a fhady place, till it is wanted for ufe: but care muft be taken not to hang it againft a wall, becaufe this will make it turn black and mouldy. The fame will alfo happen to mint that is cut in wet weather.

If the foil be fit for this plant, it will afford three general cuttings every year: but thofe fhoots which come out after July, are feldom good for much. Thefe fhould therefore be let ftand till Michaelmas, when it will be right to cut the whole down clofe to the ground, and, after carefully clearing away all the weeds, to fift a little fine rich earth all over the beds, to the thicknefs of about an inch. This will give vigour to the roots left in the ground, and will make them fhoot out finely the next fpring.

MIST, a meteor confifting of grofs vapours floating near the furface of the earth.

The bluifh mift, which we fometimes fee on our fields and paftures in a morning though often innocent, yet has been in fome places found to be the actual caufe of murrain, and other fatal difeafes among the horned cattle.

Dr. Winklar gives, in the Philofophical Tranfactions, an account of a murrain affecting the cattle in Italy and other places, which was evidently feen to fpread itfelf over the countries in the form of a blue mift. Wherever this was perceived, the cattle were fure to come home fick; they appeared dull and heavy, and refufed their food; and many of them would die in four and twenty hours. Upon diffection there were found large and corrupted fpleens, fphacelous and corroded tongues; and in fome places thofe people who were not careful of themfelves, in their management of the cattle, were infected and died as faft as themfelves. The principal caufe of this difeafe feemed to to be the exhalation of ſome unwholeſome ſteams from the earth; and it was obſervable that there had been three earthquakes in Italy the year before it happened. The method of cure which ſucceeded beſt, was this: as ſoon as any beaſt appeared to be ſick, they examined the tongue, and, if apthæ, or little bliſters, were found on it, they ſcraped it with a ſilver inſtrument made with ſharp teeth at the ſides, till it bled in all thoſe parts where the apthæ were; the blood was then wiped away with a cloth, and the whole tongue waſhed ſeveral times with vinegar and ſalt. After this, the following medicine was given internally: take of ſoot, brimſtone, gun-powder, and ſalt, of each equal parts; mix theſe in as much water as will make them thin enough to be ſwallowed, and let a ſpoonful be given for a doſe three or four times a day. The cattle which were in health had this medicine given them, as well as the ſick; and the conſequence was, that very few died in Switzerland, while almoſt all died in other places.

It was very remarkable that the contagion, on this occaſion, ſeemed to travel ſlowly and regularly on: it came at the rate of about two German miles in twenty-four hours: this it kept regularly to, during the whole time of its raging, and never appeared in very diſtant places at the ſame time.

The whole ſurface of the earth emitting theſe effluvia, no cattle eſcaped them in the courſe of their way; but thoſe which were kept within doors at rack and manger fell ill at the ſame time, and in the ſame manner with theſe in open fields. Dr. Slare was of opinion, that it was owing to certain inſects which could not fly faſter than at the rate of two German miles a day; and that they travelled regularly, and ſpread the miſchief where they paſſed; but there wanted ſome judicious perſons, verſed in theſe obſervations, to have examined both the ſtate of the air, and the beaſts, on this occaſion. *Philoſ. Tranſactions*, Numb. 145.

MIXEN, a dung-hill.

MIZZY, a bog, a quagmire.

MOAR-LOVRE, a term uſed to expreſs a peculiar diſtemperature of corn, generally comprehended under the common term of a blight. In this caſe the earth ſinks away from the roots of the corn, and leaves the plant ſtanding in great part above ground with naked roots; theſe being too weak to ſupport the ſtalks, the plants fall, and the ears become light. This a diſtemperature peculiar to corn growing on light and looſe lands. *Tull's Horſehoing Huſbandry.*

The remedy is this: turn a ſhallow furrow againſt the rows, when they are ſtrong enough to bear it, and the mould is fine and dry; the motion of the ſtalks with the wind will draw in this looſe powder, and it will ſpread itſelf equally among all the rows, ſettle about the roots, and cover them.

MOLE, a ſmall animal too well known to the huſbandman, from the miſchief it does in the fields, by looſening of the earth, and deſtroying the roots of corn, graſs, and other vegetables.

The common method of deſtroying them is by traps, made in the following manner:

Take a ſmall board, about three inches and a half broad, and five inches long: on one ſide thereof raiſe two ſmall round hoops or arches, one at each end, like the two hoops or bails of a carrier's waggon, capacious enough for a mole to creep through eaſily: in the middle of the board make a hole about the bigneſs of a gooſe-quill, and have in readineſs to put into it a ſtick about two inches and a half long, fitted at one end to the hole, and a little forked at the other. Cut alſo a hazel or other ſtick, about a yard, or a yard and a half long, which will riſe with pretty ſtrong elaſticity, when it is ſtuck into the ground; and to the end of this ſtick faſten a very ſtrong nooſe of horſe-hair, made ſo as to ſlip eaſily. Have likewiſe in readineſs four ſmall hooked ſticks: then go to the furrow or paſſage of the mole, and after you have opened it, fit in the little board with the bended hoops downward, ſo that when the mole paſſes that way, it may go directly through the two ſemi-circular hoops. But before you fix the board in this manner, put the hair ſtring through the hole in the middle of it; place the nooſe in a circular form, ſo as to make it anſwer to the two hoops; put the ſmall ſtick before mentioned gently into the hole in the middle of the board, ſo as juſt to ſtop the knot of the hair ſpring, without entering ſo far as abſolutely to tighten it. Then faſten the board down with four hooked ſticks, and cover it with earth. When the mole, paſſing in its furrow, comes into this trap, it will diſplace the ſmall ſtick that hangs perpendicularly downward, the knot will then be drawn through the hole, and the nooſe, inſtantly ſtreightened by the riſing of the end of the hazel ſtick to which it is faſtened, which will catch the mole round the neck.

Others, watching their motions in the morning and evening, which are their uſual times of ſtirring, dig them out in a moment with a ſpaddle: and about March, which is their time of breeding, numbers of their young ones may be deſtroyed by turning up their neſts, which are generally in the greateſt hills; and the old ones who come to ſeek their young will preſently be taken.

Some commend the pot-trap, which is a deep earthen veſſel ſet in the ground with the brim even with the bottom of the mole tracks. The ſeaſon for uſing this is when the moles couple, which is about the beginning of March, or perhaps ſomewhat earlier.

Mr. Worlidge ſays, they may be driven from the gardens, meadows, and other places where one would not chooſe to dig, by fuming their holes with brimſtone, garlick, or other unſavoury things; and that the putting a dead mole into a common haunt, will make them abſolutely forſake it: to which Mr. Mortimer adds, but only upon report, that white hellebore and the roots of palma-chriſti, dried, powdered, and ſifted through a fine ſieve, then mixed with barley-meal and eggs, and worked into a paſte with wine and milk, will kill them, if laid in little pellets under their hills.

The writers of the Memoirs of the Society of Agriculture at Angers, recommend hazle-nuts boiled in an infuſion of hellebore, as a ſure method of deſtroying moles. Two or three of theſe nuts are to be laid under each mole's hill, and the creatures, by being fond of that fruit, will be poiſoned by eating them.

The way to remove mole-hills and ant-hills, which are not only diſagreeable to the ſight, but detrimental to the paſture, and a great hindrance to the mowing of the graſs, eſpecially where they are numerous, is particularly in regard to the latter, either to divide the turf which grows over them, into three parts, with a ſpade, or other inſtrument, then to pare it off each way, to dig out the middle or core of the hills, to ſpread this mould over the other ground, to leave the holes open all the winter, that the ants may be killed, to lay the turf down again in the ſpring, and to roll thoſe ſpots after the re-inſtated turfs are ſettled, and their graſs has taken freſh root; or, which is a more expeditious method, to ſcoop them out at once, with what Mr. Bradley calls a ſcolloped mole-hill plough, made in the following manner.

From *a* to *a* (Fig. 1. Plate XX.) is an iron plate, about five inches over, and above an inch thick at the back. *b b* is the ſcolloped ſpade, or tongue, of the plough, and about a foot over at the wideſt part. This, from the ſharp point, grows thicker by degrees, till it comes to the back, which ſhould be a full inch thick. The iron muſt be well hardened, and very ſharp at the edges. *c c* is the paring plate, which ſhould be very ſharp on the fore edge, and, with the ſcolloped ſpade, ſhould be four feet long from *a* to *a*. *d d* are iron ſockets, in which are fixed the plough handles, or ſtilts, *e e*. At *a a* are foot-links to ſet the harneſs on, for one horſe, or two horſes lengthwiſe, to draw by.

When this plough is uſed, the point of the ſcolloped ſpade muſt be ſet to the bottom of the hill, by raiſing the plough ſtilts, ſo that it may go into the ground; and when the hill is near cut through, the point ſhould be raiſed up again, by weighing a little on the ſtilts.

The hollow left by this plough will receive the rain as it falls, and this will drown the remaining ants.

After the mole and ant-hills, and other inequalities have been thus taken off, the beſt way is to carry them to a corner of the field, there to break them well to pieces, and mix them with a conſiderable portion of lime, or other manure ſuited to the ſoil, which will effectually deſtroy every remains of the ants, and convert the whole to good manure, which may then be profitably ſpread all over the ſurface of the ground. The ſpots on which the mole, or ant-

ant hills stood, should be loosened with a spade, then mixed with lime or other manure, and afterwards be laid down with clean grass seeds.

This method is the most advisable of any, because a fine grass will be raised in those places, instead of the coarse benty growth which occupied them before.

MOLTEN-GREASE, a fat or oily discharge with the dung, and arises from a colliquation, or melting down of the fat of the horse's body, by violent exercise in very hot weather.

It is always attended with a fever, heat, restlessness, starting and tremblings, great inward sickness, shortness of breath, and sometimes with the symptoms of a pleurisy. His dung will be extremely greasy, and he will fall into a scouring; his blood will have a thick skin of fat over it when cold, of a white or yellow hue, but chiefly the latter; the congealed part, or sediment, is commonly a mixture of size and grease, which makes it so extremely slippery, that it will not adhere to the fingers, and the small portion of serum feels also slippery and clammy. The horse soon loses his flesh and fat, which probably is dissolved and absorbed into the blood; and those that survive this shock commonly grow hide-bound for a time, their legs swelling both before and behind, and continue in this state till the blood and juices are rectified; and if this is not done effectually, the farcy, or some obstinate surfeit, generally follows, very difficult to remove.

In the first place bleed plentifully, and repeat it two or three days successively in smaller quantities; two or three rowels should also be immediately put in, and cooling emollient glysters, daily thrown up to abate the fever, and drain off the greasy matter from the intestines. By the mouth give plenty of warm water, or gruel, with cream of tartar, or nitre, to dilute and attenuate the blood; which in this case is greatly disposed to run into grumes, and endanger a total stagnation.

When the fever is quite gone off, and the horse has recovered his appetite, gentle aloetic purges should be given once a week, for a month or six weeks, in order to bring down the swelled legs; but if the purgative ingredient does not exceed half an ounce, or six drams of fine aloes, it only opens the belly gently; and, with the other medicines joined with it, passes into the blood, acts as an alterative, and operates both by urine and perspiration; as will appear by the horse's staling plentifully; and the kindly feel of his skin. To this end give the following, which, repeated for some time, will intirely remove this disorder.

> Take of succotrine aloes six drams, of gum-guaiacum powdered half an ounce, of diaphoretic antimony, and powder of myrrh, of each two drams: make into a ball with syrup of buckthorn.

Or it may be prepared with an ounce of aloes, six drams of diapente, and a spoonful of oil of amber.

These will seldom take a horse from his business above two or three days in a week; neither will he lose his flesh or appetite with them, which cannot be obtained by any other method of purging, and gives this greatly the preference in many cases.

Two ounces of nitre mixed up into a ball with honey, and a dram of camphire, will also be found an excellent medicine for this purpose, as it will powerfully attenuate the blood, and promote the due secretions; to which end it should be given every day for a fortnight, or three weeks. *Bartlet's Farriery*, p. 168.

MOLTER, the toll of a mill.

MOOR, a very fine black mould, sometimes found under a pretty thick sward of grass, but more frequently under moss, or straggling plants of heath.

It differs from peat, in that it does not stick together, nor has the fibrous roots, or bituminous viscous quality of this last. Peat, when dry, becomes hard and firm: this falls into powder. It cannot be better described, than by comparing it to that substance which is found in hollow rotten willows, and other trees of that kind; which gives room to think that it arises from rotten plants. It is of a spungy nature, and ready to imbibe moisture, which adds considerably to its weight. There is generally underneath it, as under most earths of this kind, a bed of clay, or some substance impervious to water: so that the particles of bodies decayed on their surface, not being admitted into the soil, remain upon that surface, dry there, and increase its thickness, according to the continuance of the cause.

If this kind of soil is collected in a place where running water, in rainy seasons, brings with it clay, or other fat soils, from the neighbouring grounds, it then acquires a greater degree of cohesion, hardens when dry, and resembles the cleansing of ponds, more than the former.

The most considerable soil of this kind is the sort called peat. This is usually full of roots of weeds, and even of trunks and branches of trees and other plants. It always contains a bituminous oil, which renders it very inflammable when dry; at which time it also becomes very hard, though it is quite soft when in the mine, if we may be allowed to give that name to the bed in which it lies; for there it is easily cut in the form of bricks, as we see it when used for fuel.

"The whole mass and body of this soil, says Mr. Maxwell, is a dung-hill, made up of rotten timber, grass, weeds, and often mud washed from the higher grounds about it, by the land-floods; than which there are few richer composts: only by age, and its cold situation in water, pent in about it by the neighbouring rising grounds, its salts are weakened, and its spirits become languid. The same will happen to the richest dunghill that can be made of any composition whatever, if too long kept. It will even become such as not to be distinguished, by the eye, from ordinary moss; nor will it be more useful, as dung, except either in proportion to the shorter time it has been kept, or the better situation of the place where it has stood. I believe the qualities of mossy grounds differ very little from one another in any other respect, than with regard to the better or worse quality of the mud which makes a part of their composition. They are more or less spungy, in proportion as this rich mud fills up the cavities of the component vegetables, which are preserved from putrefaction by the acid in the water. The less spungy, and the more rotten the moss is, the fitter it is for the vegetation of any thing planted in, or sown on it."

The first thing to be done, in order to the improvement of moors, is to divide them into proper inclosures; not only to secure their future produce, but also to be a means of procuring rich earth to cover the otherwise insipid useless mould on their surface, and give root to the plants which may afterwards be cultivated in them. Then, as the natural produce of this earth is of no value, its surface should be pared off, in order to be burnt. But as this subject, of burning earth, has been before fully treated of, we shall only observe here, that the husbandman should be very careful not to make the clods too dry, or light his fires in too dry a season, lest they should extend farther and deeper than was intended.

If the depth of the moorish earth be not very considerable, the surrounding ditches, which make the inclosure, will afford a rich strong soil, which should be spread about three or four inches thick all over the surface. When the clods are burnt, their ashes should be mixed with this new soil. If no proper earth can be got from the ditches, sand or gravel may be used with success, as was practised by the ancients. Gravel is singularly beneficial to such lands, as has been shewn under the article Bog.

The Berne society, who recommend this method of improvement as founded on repeated experience, very properly observe, that the good effects of the sand and gravel will be considerably increased by a moderate mixture of dung, and that, especially if the ground be intended for plowing, this covering should be at least a hand's breadth in thickness. Dung alone would undoubtedly be extremely efficacious on all such soils, in which it is remarked to be of longer service than in any other; but the farmer can seldom spare a sufficient quantity of it to go far enough unmixed, nor indeed for mixing. In this case, other ingredients must be recurred to; though the sand, or gravel, will generally do great things without any mixture. Well preserved ashes will be of excellent service, and so will the rubbish of old buildings, or any other similiar substance, when mixed with the sand or gravel, even of the coarser kind, and incorporated with this naturally rich earth, which, were its real value known, and the proper method of treating it rightly understood, might claim a preference before any other foil. Loam is ftill better than either fand or gravel. This fhould be brought on before the fires are lighted to burn the furface of the mofs, and fhould remain in heaps till it can be equally mixed with the afhes. Lime, where it can be had, will alfo contribute to the meliorating of moffy grounds. The moorifh earth, thus covered, is fitted for various kinds of crops.

Mr. King, who obferved that the places in bogs in Ireland, where a little earth had chanced to fall as the peafants were carrying it to mend the ways acrofs them, became a green fod, covered with a fine fcutch grafs, does not doubt but that the fame expence as fands or gravels land, would bring a dried bog even to be arable; and as to the common opinion that gravelling is bad for grafs, the contrary, he fays, is apparent; efpecially in bogs. Another method of reducing barren boggy land, in Ireland, is by laying upon it a little dung or ftraw, and covering this with fhells.

A ftrong proof of the propriety of covering mofs with earth, refults from a fact which happened to Mr. Græme, near Stirling. Two years after this gentleman had earthed his mofs, which he had not yet fowed, it was as full of natural white clover, and other grafs, as any field generally is in twice that time.

In the province of Groninguen, they pare off the upper furface of the foil, which is a light loofe earth, and lay it by till they have dug out the peat underneath, when they mix it with the fand which lies under the peat, and fow it with rye and hay-feed the firft year; after which they let it run to grafs, and have amazingly fine crops. In Sweden, a drained bog was remarkably improved by a peafant who burnt upon it a parcel of ufelefs wood and limeftones; and another converted his drained bog into a fine meadow, by covering it with lime and tanner's bark.

Mr. Eliot, after draining a very remarkable fwamp, fowed it with grafs-feed, fuch as red clover, fpear-grafs, fowl-meadow grafs, and herd grafs; none of which came up fo well as the red clover, which he found to be the boldeft and moft hardy. Though this came up well, yet, where the fward was ftrong, what with the toughnefs of the ground and the over-topping growth of the wild natural grafs, it made but flow progrefs till the fall of the year, and then it mended confiderably. The other forts of grafs came up but poorly, the land being, as Mr. Eliot judges, too new and tough for them. In September, he ploughed up a piece of this ground, where he had not fowed any grafs. It ploughed very tough, and the cattle mired in fome places; but he kept them as much as poffible upon the grafs; notwithftanding which there was a neceffity of leaving many baulks. About a month after, he ordered thefe baulks, to be hoed up, and was agreeably furprifed to find how eafily this was done. He found the meadow rotted and mellowed more in one month in the fall, than it had been in the whole fummer; but thinks the ploughing would have been performed with much greater eafe, if it had been deferred till a month later. In July, he fowed a little piece with turnips, which came up, but did not grow well till the ground began to rot in the fall of the year, when they throve perfectly, and were good and fweet, inftead of being rank, as he expected.

This gentleman found by experience, that fuch drained land muft have one fummer to ferment and rot, fo as to become proper foil, before it will be fit for grain or every fort of grafs. "If, fays he, I had fowed red clover inftead of the other forts of grafs, I had faved five pounds in feed. Clover out-did my expectation, and the other forts fell fhort of it. If others fave where I loft, and mend wherein I was miftaken, it anfwers my defign in writing.

"By a little experience which we have had of thefe drained lands, we find they will produce Indian corn, fixty or feventy bufhels to an acre, and flax. If life and health be continued, I defign to try liquorice-roots, barley, Cape-Breton wheat, cotton, indigo-feeed, wood for dying, and the water melon. But what I have principally in view is hemp. New-England doth not, I fuppofe, expend lefs than feveral hundred thoufand pounds worth of foreign hemp yearly. If we can raife more than to fupply our own occafions, we may fend it home. It is not a mere conjecture, that the drained lands will produce hemp. I am informed by my worthy friend Benjamin Franklin, Efq; of Philadelphia, that they raife hemp there upon their drained lands.

"Hemp requires fuch very ftrong land to produce it, that it would confume all our dung to raife it in any great quantities; fo that we fhould not be able to raife bread-corn: therefore, how inviting foever the trade is, and how great foever the encouragements have been, both from home and by our own government, we have not as yet engaged in that affair. We have now a promifing profpect of fuccefs in thefe drained lands: what may be the iffue, time and experience muft determine. A meadow of drained land, which could be laid under water, and this drawn off at pleafure, would probably be of great value. I have heard that a man in the Jerfies hath fuch a meadow, which thotugh only half an acre in exent, yields him as much hemp yearly, as fells for fifty pounds, York money: but this feems incredible."

Whatever advantages are reaped from hemp, may alfo be received from flax, if rightly managed, upon moffy grounds. Some improvers in Scotland have already tried it with fuccefs, and though, a new attempt, doubt not its anfwering well in that kind of foil. The moft approved method of cultivating and dreffing each of thefe fingularly beneficial plants, are given under the articles HEMP and FLAX.

"It is common in fwamps, continues Mr. Eliot, to find the mofs two or three feet deep. At firft, I was perplexed how to get rid of it, and fomewhat doubtful whether the land would be worth any thing, if this furface was removed. When the water was drawn off by ditches, the mofs grew fo dry, that in a hot fummer feafon, it would burn quite down to the ground. To burn this, or any other trafh you would confume upon land, fet fire to it when the weather is clear, the fun hot, and a ftrong foutherly wind blows, which makes fire rage more fiercely, and do much more execution, than a northerly or wefterly wind. In a northerly wind the air is thin and light, fo that the fire is not ftrongly compreffed: the moift heavy fouth wind prevents the diffipation of the fire, and renders it more compact. Thus we fee a fmith fwab and wet his coals, by which means the heat is greatly increafed. Whether this reafoning be juft or not, the fact is certain, and that is the chief concern of the farmer.

"Deep fwamps are preferable to thofe which are fhallow: for experience fhews, that a deep foil bears extreme drought better than any other land, in the hot feafon. The cold drought in the fpring will hurt fuch land, fo that the firft crop of grafs will not be very great; but the fecond crop will be extraordinary good.

"The red clover in my drained land above-mentioned, looked in the cold drought at the latter end of the fpring, as if it would not come to any thing: but it recovered a good colour, and grew up well, when hot weather came on, though the drought continued. This is fuch an advantage as will always recommend a foil eight or ten feet deep.

"Our ditching and draining dry only the top of the ground, not more than three feet deep in the hot and dry feafon; I fuppofe that the moifture from the mud and water underneath is drawn up by the force of the fun, fo that the roots of the grafs are furnifhed with fufficient moifture to bring forward the vaft burthen they frequently bear. But this is not to be expected till the land be concocted, changed, and altered by the fun and air: for at firft, foon after it is drained, it is pinched with the drought more than any other land.

"Thofe fwamps which are thick overgrown with mofs, prove as good as any other drained land, when they are fo far dried by draining, that the mofs will rot, or burn off. I mention this, becaufe it is beft that the farmer work as free from difcouragement as poffible.

"Our drained land, though in all other refpects well adapted for producing Indian corn, is of fo loofe a texture that the plants become an eafy prey to crows and other birds, which, if not prevented, will pull up a great part of them, and deftroy the crop. To guard againft this great difcouragement in all fuch land, "Take the roots of swamp hellebore (known in different places by the several names of skunk-cabbage, tickle-weed, bear-root) and boil them in so much water as to keep them covered an inch deep: by two hours boiling, the liquor will be of sufficient strength: strain it off; put your corn into it while the liquor is warm, and let it steep twenty hours. It will then be fit for planting.

"This is found to be an effectual security. The Rev. Mr. Todd observes, that after meeting with much trouble and loss, by having his corn repeatedly pulled up, he planted his ground with corn steeped in this liquor; but not having enough of that, he ordered the planting to be finished with unsteeped corn. The event was, that the birds pulled up but two or three hills of the soaked corn, but left not one in ten of those which were planted with unsoaked corn. He planted anew, with steeped corn, the hills where the plants had been thus pulled up, except a few of them in the middle of the field, which were planted a second time with unsteeped corn, upon a supposition that the birds would not find them out: but the result was as before: all the unsoaked was pulled up, and the hills planted with the steeped corn were spared.

"Upon the whole," says Mr. Todd, "I think this experiment a full proof that corn so prepared when planted, is secure from the birds; the knowledge of which may be of great service to husbandmen, as the preparation is cheap and easy, and our swamps seem to be the best land we have for Indian corn. My little swamp this year yielded after the rate of above ninety bushels to the acre, and was easier and cheaper tilled than the same quantity of upland." *See the article* BOG.

MORES, or *Moars*, hills.

MORGAN, the same with May-weed. *See the article* MAY-WEED.

MOSS, a name given to moory or boggy grounds, in many parts of England. These sorts of land consist of a turfy surface, below which is a black, moist, spongy earth, which being dug up with spades, almost in the form of bricks, and dried, is what they call peat, and used as fuel in several parts.

The shortest method of all for the improvement of moss, if the ground be designed only for grass, and its situation be such as admits of it, is this: first drain the moss, and if there be heath upon it, burn that off, and make the surface even. Then make a dam at the lowest part, and a sluice, and work the water upon it through the winter. The mud which comes with the land flood will bring a fine sward upon it in two or three years, and be afterwards a yearly manure; so that it will bear annual cutting, and, besides, be good pasture for cattle, after the sward is become strong enough to bear them.

Mr. Græme found that the improvement of moss may be endangered by draining it too much; for his crops were best where the surface of the water in the surrounding ditches was not above three feet lower than the level of the moss. It will, undoubtedly, be a vast advantage to an improved moss, if the farmer is able to flood it at proper times, by means of a sluice in the lowest part of the surrounding ditch, as mentioned before. This will greatly promote the growth of plants; but should be used with the caution of not letting the water remain too long at a time upon the ground, because, though there will be no danger of its re-converting the soil into a bog so long as there are channels to carry it off, it will be apt to chill, and thereby hurt the plants. *See the article* BOG, *and* MOOR.

MOSS *on Trees*, is a distemper of very bad consequence to their increase, and much damages the fruit of the trees of our orchards.

The present remedy is the scraping it off from the body and large branches, by means of a kind of wooden-knife, that will not hurt the bark; or with a piece of rough hair-cloth, which does very well after a soaking rain. But the most effectual cure is, the taking away the cause. This is to be done by draining off all the superfluous moisture from about the roots of the trees, and may be greatly guarded against in the first planting of the trees, by not setting them too deep.

If trees stand too thick in a cold ground, they will always be covered with moss; and the best way to remedy the fault, is to thin them. When the young branches of trees are covered with a long and shaggy moss, it will utterly ruin them; and there is no way to prevent it, but to cut off the branches near the trunk, and even to take off the head of the tree, if necessary, for it will sprout again; and if the cause be in the mean time removed by thinning the plantation, or draining the land, the young shoots will continue clear after this.

If the trees are covered with moss, in consequence of the ground's being too dry, as this will happen from either extreme in the soil, then the proper remedy is, the laying mud from the bottom of a pond or river, pretty thick about the root, opening the ground to some distance and depth to let it in; this will not only cool it, and prevent its giving growth to any great quantity of moss, but it will also prevent the other great mischief which fruit-trees are liable to in dry grounds, which is, the falling off of the fruit too early. *Mortimer's Husbandry.*

False MOTH, an insect which proceeds from a small caterpillar, the body of which is smooth and whitish. It has sixteen legs, does not lodge in the grains of corn, but contrives to fasten several of them together with a web which it spins, and with which it makes itself a dwelling place like that of common caterpillars. This dwelling place, or sheath, in which the caterpillar of the false moth usually abides, is generally in the middle of the little heap of grains which it has collected for its food: but, which distinguishes it from the caterpillar of the true moth, it can quit this sheath at any time, to eat the grains around it, one after another. It generally attacks several grains at once, and always without order, eating sometimes of one, and sometimes of another; so that several are gnawn, when not one is wholly consumed. When these insects are very numerous in a granary, all the grains upon the surface of the corn are linked together by a web, so as to form a crust, which is sometimes three inches thick. This caterpillar turns into a chrysalis, or aurelia, in a grain which it has hollowed, or in the sheath of its web, and issues from thence, in the month of June, in the form of a butterfly. When a heap of corn is stirred in which there are many caterpillars of the species of this false moth, those insects crawl up the walls; but they soon return to the heap, and, by the very next day, cover it all over with a new web.

In its state of moth, it is grey, has six legs, and is frequently seen in vast numbers fluttering about the eaves of the windows of granaries, in the spring and summer, when the weather is very hot. The females lay their eggs upon the heaps of wheat, and these eggs produce the caterpillars, or corn worms, as some call them, which feed on the grain, and envelop it with their silky web, so as to form over the whole surface a crust that is sometimes three or four inches thick. This entirely spoils the corn within that depth, besides communicating a bad smell to all the rest. These worms, or rather caterpillars, for they have sixteen legs, are smooth, whitish, and seldom exceed a quarter, or at most the third part of an inch when at their full growth. Breaking of their webs avails but little, for they are woven again by the next day: for which reason some have been of opinion, that it is best to let them enjoy undisturbed the surface of the corn of which they have taken possession. But it should be considered, that three inches are a sixth part, and four inches upwards of a fifth, of any quantity of corn spread eighteen inches deep, which is the medium thickness at which it is laid; and that, independant of the bad smell with which the rest is tainted, this is a very considerable object, though it extend no farther. When this crust is broken, most of the grains which compose it are found to be either gnawn in their inside, or full of live worms, or of aureliæ, according to the season; or one sees only the empty sheaths of the catterpillars, if the aureliæ have been transformed into moths.

It is said, that strewing the corn with powdered lime, so as to form a crust over it, will preserve it from the ravages of these insects: but as the surface would still be spoiled, and as that surface may be a considerable part of the small provision of wheat allotted for a family only, M. Duhamel did not try this expedient. Covering

vering it with hay, which he did try, anſwered no end whatever.

Theſe obſervations, and the reflections conſequent thereon, made him ſuſpect that this inſect, as it delights in none but very warm places, would not be able to live in the cold air of his ventilating granaries.

Accordingly, in the winter of the year 1746, he collected all the wormy cruſts which theſe caterpillars had formed in his common granaries, where they were very thick, the moths having been extremely numerous the preceding ſummer. Theſe cruſts were broken and ſcreened; and what grain could be got from them, which undoubtedly was impregnated with the eggs of the moths, was put into one of his granaries of preſervation, which contained ſeventy-five cubic feet, and was ventilated from time to time during all the winter.

Towards the end of May, when the vent-holes at the top of this granary were opened, a prodigious number of moths flew out, which ſhewed that they did not like their ſituation.

When the wheat was thought to have been ventilated ſufficiently, the holes were ſhut cloſe, and nothing more was done to it for a month: for as this corn (which had not been ſtove-dried) was old and dry enough, it was but ſeldom ventilated.

In June 1747, this granary was emptied: all the moths and worms were dead, and there remained only a thin cruſt, not above a twelfth part of an inch thick, on the top of the corn, which had ſo far loſt the bad ſmell it had when put into the granary, that it ſold for the current market price.

Not ſatisfied with this ſingle method, M. Duhamel tried the effect of the ſtove upon another parcel of wheat known to be full of theſe worms. A heat from 45 to 50 degrees of Réaumur's thermometer (from 115 to 124 of Farenheit's) killed them all. This corn was then laid up in a common granary, where it remained two years without being attacked by any of theſe moths; and even in the third, but very few of them appeared.

Theſe experiments remove all doubt of the poſſibility of deſtroying the corn moth, or worm, without hurting the grain, which would otherwiſe be ſpoiled by it; and as that grain, generally is wheat, which the inſect prefers to any other, this diſcovery is of great importance to the huſbandman, as well as to the public.

MOULD, a looſe kind of earth, every where obvious on the ſurface of the ground, called by ſome mother earth, and by others loam.

The goodneſs of a mould for the purpoſes of agriculture and gardening, &c. may be known, according to Mr. Miller, by the ſight, ſmell, and touch. 1. Thoſe moulds that are of a bright cheſnut or hazely colour, are counted the beſt: of this colour are the beſt loams, and alſo the beſt natural earth; and this will be the better yet, if it cut like butter, and does not ſtick obſtinately, but is ſhort, tolerably light, breaking into ſmall clods, is ſweet, will be tempered without cruſting or chopping in dry weather, or turning to mortar in wet. Next to that the dark grey and ruſſet moulds are accounted the beſt: but the light and dark aſh coloured the worſt, ſuch as is uſually found on common heathy ground: the clear tawney is by no means to be approved; but that of a yellowiſh red colour is the worſt of all: this is commonly found in wild and waſte parts of the country, and for the moſt part produces nothing but goſs, furze, and fern, according as their bottoms are more or leſs of a light and ſandy, or of a ſpewey gravel, or clayey nature. 2. All lands that are good and wholeſome, will, after rain, or breaking up by the ſpade, emit a good ſmell. 3. By the touch we may diſcover whether it conſiſts of ſubſtances entirely erenaceous, or clammy; or, as it is expreſſed by Mr. Evelyn, whether it be tender, fatty, deterſive, or ſlippery; or more harſh, gritty, porous, or friable.

MOULDINESS, a term applied to bodies which corrupt in the air, from ſome hidden principle of humidity therein; and whoſe corruption ſhews itſelf by a certain white down, or lanugo, on their ſurface, which, viewed through a microſcope, appears like a kind of meadow, out of which ariſes herbs and flowers, ſome only in the bud, others full blown, and others decayed, each having its root, ſtalk, and other parts.

MOUND, a bank or fence of earth. *See the article* BANK.

MOW, the pile or collection of corn in the ſtraw, placed in a bay of a barn. *See the article* BARN.

MOW-BURNT, over-heated in the mow for want of being dry.

MOWING, the art of cutting down corn, graſs, &c. with a ſcythe.

M. de L'Iſle lately introduced the mowing of wheat. The method is this: the ſcythe he uſes is at leaſt ſix inches ſhorter in the blade than the common ſcythe, and inſtead of a cradle has two twigs of ozier put ſemicircular-wiſe into holes made in the handle of the ſcythe, near the blade, in ſuch a manner, that one ſemicircle interſects the other: this method is frequently practiſed by the men who mow our meadows, as they think a cradle unneceſſary and cumberſome, unleſs the ſcythe is to carry over a large and very heavy ſwarth.

In mowing barley, or oats, the corn is always on the right-hand of the workman: but by M. de L'Iſle's method of mowing wheat the corn is at his left-hand: he mows it inward, bearing the corn he cuts on his ſcythe, till it comes to that which is ſtanding, againſt which it gently leans. After every mower follows a gatherer, which may be a lad of twelve or fourteen years of age, or a woman. The gatherer keeps within five or ſix feet of the mower, and being provided either with a hook or ſtick about two feet long, gathers up the corn, makes it into a gavel, and lays it gently on the ground: this muſt be done with ſpirit, as another mower immediately follows; for to every mower there is a particular gatherer.

To do this work properly, the mower ſhould form but one track with his feet, advancing in a poſture nearly as if he was going to fence, one foot chaſing the other. In this manner the ſtanding corn is mowed; but the workman muſt take care to have the wind at his left, as it bears the corn towards the ſcythe, and cauſes it to be cut nearer the ground. If the wind is behind the mower, it is no great inconvenience: it only occaſions the ſcattering of a few ears; and the cut corn, which ſhould lean againſt the ſtanding corn, is ſometimes thrown down; which makes the work go on ſlower, and encreaſes the gleanings. The wind in front is very bad; the corn cannot be cut cloſe, and there is a great loſs: but the wind on the right-hand is worſt of all; the ſtubble is left long, and ſuch a quan- of gleanings, that one would imagine no crop had been taken off. When wheat is bent, the workman takes the corn as it preſents itſelf to him, which has the ſame effect as if the wind was at his left-ſide. When wheat is laid, it is more troubleſome to the gatherer, becauſe the cut corn is apt to be mixed with that which is ſtanding; but a good mower takes the advantage of the wind, and cuts it againſt the way it is laid. No particular directions can be given for corn that is lodged and tangled, unleſs it is to take it as it is inclined, as if the wind was in the back of the mower.

This method of mowing wheat was tried in Northamptonſhire, and the following account of it ſent to the editors of the Muſeum Ruſticum.

" A gentleman, a foreigner, ſays this writer, came down here to a neighbour's of mine, in order to put us into a method of going about this work.

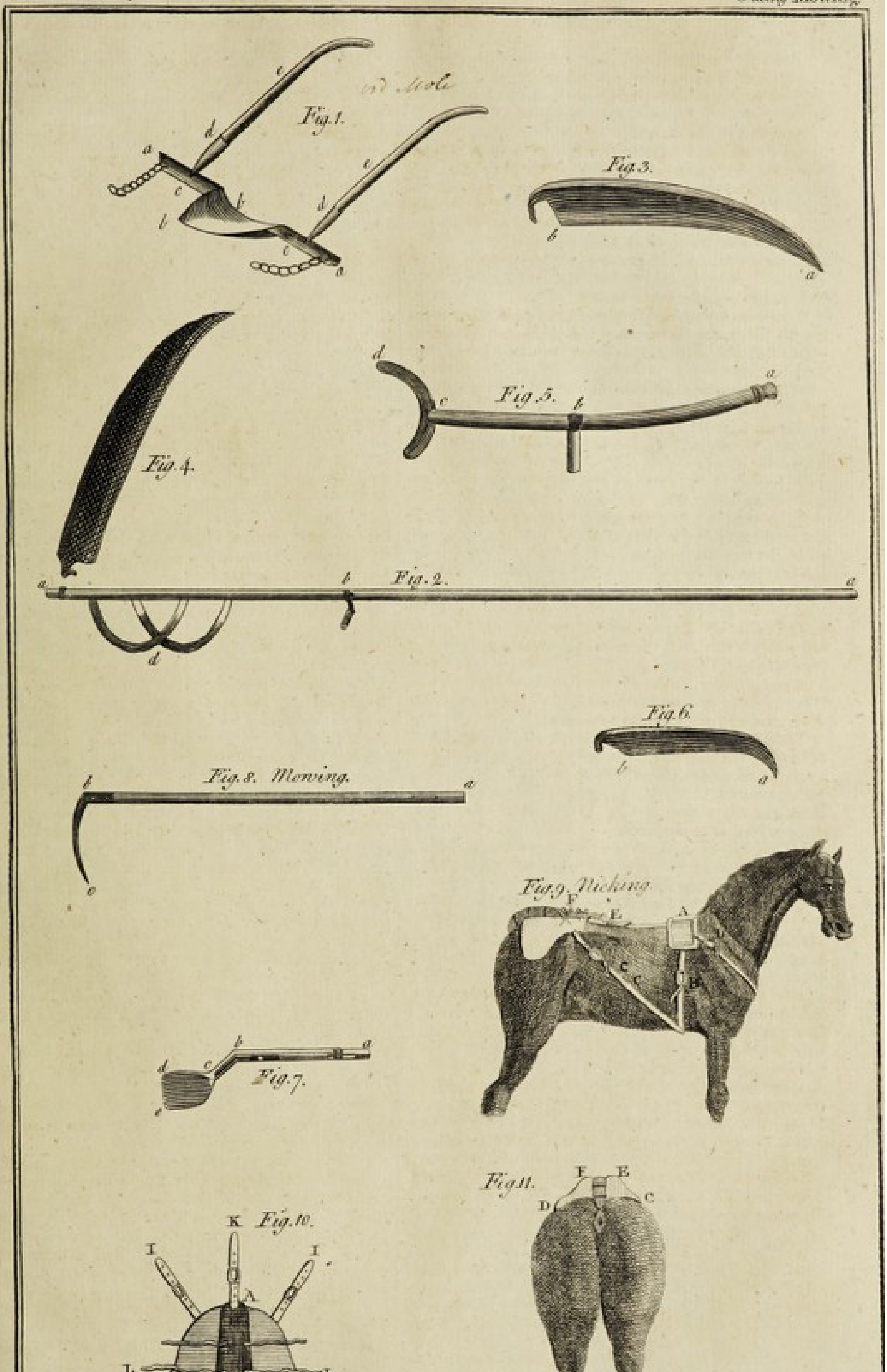
" Many trials were made in the preſence of myſelf, and a great number of others: the ſcythes did their work well; they cut the corn within two inches of the ground: and though our workmen were of courſe a little aukward, ſcarcely any ears were ſcattered: but the greateſt advantage is, that a man with one of theſe ſcythes can cut down at leaſt double the quantity of wheat in the day he can with a ſickle or hook.

" The chief objections made to the introduction of this method were, that the ſtubble is left too ſhort, and on that account is not fit for thatching; that the weeds are cut with the corn, and will be apt to mould or heat, and the ſeeds to mix with the corn in threſhing; and that the poor are deprived of their gleanings, as none of the corn is ſcattered.

" But theſe objections muſt ſoon fall to the ground, when we reflect that, by mowing, the ſtraw is much longer, and certainly ſtraw is much better for thatching than ſtubble.

" As

PLATE XX. *Facing* Mowing.



"As to the weeds being cut with the corn, it is of no consequence; for they are easily shaken out of the bottoms of the sheaves, after drying a day or two; and the sheaves may be safely left to dry, if they are laid in the following manner.

"Suppose three tobacco pipes to represent three sheaves, the bowls to be the feet of the sheaves, and the small part the ears: lay one of these on the ground; then take another, and lay the bowl of it under the small end of the first; take afterwards a third, and disposing them in form of a triangle, lay the bowl of the third under the small end of the second, and the bowl of the first under the small end of the third: by disposing them in this form, the ears are always kept from the ground, and will endure a great deal of wet without damage.

"As to the seeds of the weeds being threshed, and mixing with the corn, that may easily be avoided; for the wheat, by this method of mowing it, is so regularly disposed in the sheaf, that the sheaves need only to be threshed on the ear, without being unbound.

"The objection, that the poor would be deprived of their gleanings, is a mere farce: their time might be much better employed; and by the same parity of reason, the more corn the farmer left for them in the field, the more justice he would do them; and this few would venture to assert, as custom might in time extend it to half the crop: besides, as by this new method, a great deal more corn will be inned, it will of course be cheaper the year round, and easier purchased by the poor.

"The foreign gentleman was of great use to us: he is intelligent and communicative, and we all of us acknowledge ourselves much obliged to him.

"Many in this county propose making more extensive trials of it next harvest, and there is no doubt but that in the space of a few years it will be brought into constant use.

"A short certificate of the advantages resulting from the practice of this method, was some time ago drawn up: it was presently signed by a number of gentlemen, farmers, gardeners, labourers, &c. and transmitted to Dr. Templeman, secretary to the Society of Arts in London, to be, if necessary, published for the benefit of the kingdom. This new method will doubless be introduced to the knowledge of the English world with a better grace, coming under the sanction and recommendation of so respectable and useful a society."

The authors are happy, that, as members of the society, they have an opportunity of conveying to the readers of this Dictionary, a perfect idea of the form of the scythes lately tried in Northamptonshire: for this purpose they have annexed a plate engraved from a drawing taken from the three scythes now deposited in the Society's machine-room, for the inspection of the curious. The parts are represented separate, that they might be more distinct: the dimensions and proportions follow. Plate XX. Fig. 7. is the handle, or mounting of the largest scythe: the length of it from *a* to *c* is eight feet, from *a* to *b* five feet, from *b* to *c* three feet: at *c* is the part whereon the blade is fixed, *d* shews the two bends which serve instead of a cradle. Fig. 3. is the blade to this scythe: from the heel *a*, to the point *b*, measures three feet, and it is two inches and a half broad: when the scythe is mounted, from the point of the blade *b*, to the end of the long handle *a*, measures an angle of seven feet. Fig. 4. is the blade of another scythe, the length and breadth the same as the last blade. Fig 5. is the handle to this second scythe: from *a* to *d*, it measures three feet ten inches, from *a* to *b*, two feet, and from *b* to *c*, one foot seven inches: the blade is fixed at *a*, and when the scythe is mounted, the angle from the point of the scythe-blade to the end of the handle, measures three feet nine inches. Fig. 6. is the blade of the smallest scythe: from *a* to *b*, it measures one foot nine inches, and is two inches and a half broad. Fig. 7. is the handle or mounting to this last scythe: at *a* the blade is fixed: from *a* to *b* is one foot five inches and a half; the angle from *b* to *c*, four inches and a half; from *c* to *d*, five inches; from *d* to *e*, three inches and three quarters. Fig. 8. is the gathering-hook: the length of its handle, from *a* to *b*, is three feet nine inches; the hook from *b* to *c*, is ten inches long.

MUCK, dung, or straw that lies rotting.

MUD, the sediment at the bottom of rivers, ponds, ditches, &c. *See the article* DUNG.

MUGWORT, a very troublesome weed; for its roots creep far under the surface of the ground, so as soon to overspread a large space, if they are not stopped; and its seeds, being light, and easily carried to a distance by the wind, will produce numbers of new plants the next spring. It has plain cut leaves, ending in many parts, woolly underneath, and single spikes of pale yellow oval flowers, which blow in June.

MULBERRY, the name of a tree, of which there are several species, but two only are generally cultivated, called the black and white mulberry.

The black mulberry grows naturally in Persia, from whence it was first brought to the southern parts of Europe; but is now become common in every part of Europe, where the winters are not very severe: for in the northern parts of Sweden, these trees will not live in the open air; and in several parts of Germany they are planted against walls, and treated in the same way as peach and other tender fruits are here.

These trees are generally of both sexes, having male flowers or katkins, on the same tree with the fruit; but it often happens, that some of the trees which are raised from seeds, have only male flowers, and produce no fruit; so that those who plant these trees for their fruit, should never make choice of such as have been propagated by seeds, unless they have seen them produce fruit in the nursery. It is also the surest way to mark such trees as are fruitful in the nursery, at the time when their fruit is upon them, because those trees which are propagated by layers, are sometimes of the male sort.

The old mulberry trees are not only more fruitful than the young, but their fruit are much larger and better flavoured; so that where there are any of these old trees, it is the best way to propagate from them, and to make choice of those branches which are most fruitful. The usual method of propagating these trees, is by laying down their branches, which will take root in one year, and are then separated from the old trees; but as the most fruitful branches are often so far from the ground as not to be layed, unless by raising of boxes or baskets of earth upon supports for this purpose; so the better way is to propagate them by cuttings, which, if rightly chosen and skilfully managed, will take root very well; and in this method there will be no difficulty in having them from trees at a distance, and from the most fruitful branches. These cuttings should be the shoots of the former year, with one joint of two years wood to their bottom; the cuttings should not be shortened, but planted their full length, leaving two or three buds above ground. The best season for planting them is in March, after the danger of hard frost is over; they should be planted in light rich earth, pressing the ground pretty close about them; and if they are covered with glasses, it will forward their putting out roots; but where there is no such conveniency, the ground about them should be covered with moss, to prevent its drying; and where this is carefully done, the cutting will require but little water, and will succeed much better than with having much wet. If the cuttings succeed well, and make good shoots, they may be transplanted the following spring into a nursery, where they should be regularly trained to stems, by fixing down stakes to each, to which the principal shoots should be fastened; and most of the lateral branches should be closely pruned off, leaving only two or three of the weakest to detain the sap, for the augmentation of the stem; for when they were quite divested of the side shoots, the sap is mounted to the top, so that the heads of the trees grow too fast for the stems, and become too weighty for their support. In about four years growth in the nursery, they will be fit to transplant where they are to remain; for these trees are transplanted with greater safety while young, than when they are of a large size.

The white mulberry is commonly cultivated for its leaves to feed silk-worms, in France, Italy, &c. though the Persians always make use of the common black mulberry for that purpose; and it is said that the worms fed with those of the black produce much better silk than those fed with the white; but it is to be observed, that the leaves of the black sort should never be given to the worms,

worms, after they have eaten for fome time of the white, left the worms fhould burft, which is often the cafe when they are thus treated.

The trees which are defigned to feed filk-worms fhould never be fuffered to grow tall, but rather kept in a fort of hedge; and inftead of pulling off the leaves fingly, they fhould be fheared off, together with their young branches, which is much fooner done, and not fo injurious to the tree.

This white fort may be propagated either from the feeds or layers, as the black mulberry, and is equally hardy; but the moft expeditious method of raifing thefe trees in quantity, is from the feeds, which may be procured in plenty from the fouth of France and Italy. The beft way to fow thefe feeds, in England, is to make a moderate hot bed, which fhould be arched over with hoops, and covered with mats; upon this bed the feeds fhould be fown in the middle of March, and covered over with light earth about a quarter of an inch deep: in very dry weather, the bed muft be frequently watered, and in the heat of the day fhaded with mats, and alfo covered in the nights when they are cold. With this management the plants will come up in five or fix weeks, and as they are tender when they firft appear, fo they muft be guarded againft frofty mornings, which often happens in May. During the fummer they muft be kept clean from weeds, which is all the culture they require: but there muft be care taken of them the firft winter, efpecially to cover them in autumn, when the firft frofts come, which will kill the tender plants to the ground, if they are not protected; the following March, thefe plants fhould be tranfplanted into the nurfery, to get ftrength, where they may remain two or three years, and then fhould be removed where they are to continue.

MULE, a mongrel kind of quadruped, ufually generated between an afs and a mare, and fometimes between a horfe and a fhe-afs.

The mule is a fort of a monfter, of a middle nature between its parents, and therefore incapable of propagating its fpecies; fo careful is nature to avoid filling the world with monfters. Mules are chiefly ufed in countries where there are rocky and ftony roads, as about the Alps, Pyrenees, &c. Great numbers of them are kept in thefe places; they are ufually black, ftrong, well-limbed, and large, being moftly bred out of the fine Spanifh mares.

In Spain there is great encouragement for breeding and training mules to every kind of bufinefs: in Portugal they are eftimated at a high price, and are not a little valued in the fouthern parts of France.

I own, fays a writer in the Mufeum Rufticum, I have often been aftonifhed (the ufeful nature of this creature confidered) that we do not more encourage the breed in England. This inattention may perhaps proceed from mules being thought naturally more vicious than horfes: I doubt the fact; yet be it as it will, they are, to my knowledge, equally capable of being made ufeful, docile, and gentle.

I affert not this merely from opinion, having had many years experience of what may be done in this way.

During the courfe of the war, in which his royal highnefs the duke of Cumberland commanded the army of the allies in Flanders, the emprefs queen made him a prefent of above fifty fine mules to carry his baggage: thefe mules, at the end of that war, were brought to England, at which time I had an opportunity of feeing and admiring them. They were, I think, the fineft and largeft I ever before beheld; and one, nearly white, particularly attracted my attention, being almoft fixteen hands high.

This circumftance of feeing his highnefs's ftring of mules, it was firft induced me to think of breeding them, in which I have fince had uncommon fuccefs.

I had many encouragements to make the attempt: my fortune was fuch as could not be hurt by the experiment; my park was extenfive, and very proper for the purpofe; and I had many fervants, who had fo little to do, as to have leifure time enough to obey my orders in this matter.

My great difficulty at firft fetting out was to procure a he afs or two to cover my mares; for I found none were to be got of any fize bred in England.

It is true, I met with fome Spanifh affes; but they were fluggifh, and not likely to get mettled colts: befides, I could not buy two of them, of any fize and fhape, under feven hundred pounds, which I thought too much money to throw away, if I could by any other means get my end eafily anfwered.

Senfible that perfeverance does much in all things, I bought a ftrong-boned, fine-fhaped he afs, and two fhe affes of a large fize, confidering they were bred in England, determined to try if I could not by a little care and attention mend the bred, before I attempted to get any mules.

Thefe coft me only four pounds, and my two fhe affes foon afterwards dropped a foal each.

I continued to breed from them for feveral years; but it is the manner in which I managed the afs colts, that the great fuccefs I have lately had in breeding mules muft be afcribed.

I took care that the fhe affes fhould be well fed, and be kept in order, both before they dropped their foals, and afterwards whilft they fuckled.

As foon as the colts were weaned, I had them as carefully attended and fed as if they had been got by Childers or Babram: every winter they ftood under cover, defended from the injuries of the weather, and were regularly fed, cleaned, and littered, the door of the ftable being always left open two or three hours in the middle of the day, for them to exercife themfelves as they thought proper, which they feldom failed to do, if the weather was fine, to fome purpofe, returning, without compulfion, when the hour of feeding approached.

In this manner I always managed them till they were three years old, when I permitted my ftone colts to cover, and my females to breed.

You would indeed be furprifed to fee how much, by this plain and fimple management, my breed of affes is improved; for I have now in my ftables feveral he affes, which I keep as ftallions, that are, I believe, as large, and as well fhaped, as any that were ever heretofore bred in thefe iflands.

I fhall now proceed to defcribe to you the manner in which I breed my mules. For this purpofe I chufe mares that are of a very large breed, fuch as are fometimes ufed to draw the brewers drays in London.

My next care is that they are young, full of life, large barrelled, but fmall limbed, with a moderate fized head, and a good forehand. At the proper feafon my mares are covered by my afs ftallions, and they feldom mifs. During the time the mares are in foal, I take care to have them fed with nourifhing fodder, fuch as I imagine will moft contribute to the fize of the foal.

My expectations, after this management, are generally anfwered, for in due feafon my mares drop foals, which I could often fell for ten, and fometimes for twenty guineas a piece at three months old; and their future value is more than in proportion encreafed afterwards.

I always houfe my mule colts the firft winter; otherwife the hard frofts, and fharp, cold, long nights, would ftint them in their growth, befides making them unfhapely and rough.

From the time of their being dropped, I caufe them often to be handled, to make them gentle: this prevents their hurting themfelves by fkittifhnefs, and fudden frights: they are befides much eafier broke at the proper age, and become docile and wonderfully harmlefs, having nothing of that vicioufnefs which is fo commonly complained of in thefe animals.

I have them for the moft part broke at three years old, but never permit them to do much work till four: they are thus fecure from being hurt by hard labour, till they have acquired ftrength enough to bear it without injury.

I have now feveral mules which I conftantly employ in various kinds of labour; two, which are indeed very fine, I ride myfelf after my harriers; two more I keep for my huntfman, and one for my whipper-in: thefe are black, forrel, and grey.

I have alfo four fine mules, but ftronger and heavier than thofe above mentioned, which I drive occafionally in a four-wheel chaife, befides feveral others lefs valuable, ufed for ploughing and carting.

Some of my neighbours fmile at my tafte; yet they cannot at the fame time help acknowledging, that they are

are cheaper animals, when bred at home, as has been my practice, than horses.

Perhaps some of your readers, from the hints above thrown out, may be inclined to try the experiment: if so, I would caution them against some errors I at first setting out fell into.

I thought at first I could not keep my colts too well during the winter months: accordingly I ordered that they should have the sweetest hay, which I had before ordered to be reserved for my cows, and as many oats as they could eat.

This way of feeding them, it is true, made them very fat; but it was far from being an advantage to them; for I afterwards found by experience, that it was not only incurring a much larger expence than was any ways necessary, but also made them wonderfully nice and delicate in their appetites ever after, and also by encreasing their weight of flesh, made them more subject to strains and hurts in their morning gambols.

Finding this to be the case, I altered my method entirely, and contented myself with giving them food enough to prevent their losing flesh, and keep up their growth, without palling their appetites with delicacies, or making them over fat: as to the rest, I took the same care of defending them from the injuries of the weather as ever, by allowing them stable room, and good litter to sleep on, besides causing them every day to be well rubbed down with a hard wisp of straw by an active groom, whose peculiar province it was to attend them; and this was scarcely ever omitted, particularly in cold, raw, wet weather, when they were least inclined to exercise themselves in the park. *Museum Rusticum, vol.* II. *page* 162.

MULCH, straw half rotten.

MULLOCK, dirt, or rubbish.

MULLEIN, the name of a biennial plant, which perishes soon after it has perfected its seeds. The leaves spread on the ground, are nine or ten inches long, and six broad, very woolly, of a yellowish white colour, and very little footstalk. The stem rises four or five feet high, and the upper part of it is garnished with yellow flowers, which sit very close, and form a thick spike. These flowers have an agreeable odour, appear in July, and the seeds ripen in autumn.

This plant commonly grows by the sides of highways, and on banks: but if it once gets into the fields in a warm exposure, and is suffered to seed there, it will soon overrun the whole ground. It may be easily destroyed by cutting off the stem, when it is in flower.

MURE, the cake of apples, grapes, &c. left in the press, after extracting the juice.

MURRAIN, or *Gargle*, a contagious disease among cattle.

The most remarkable murrain is that mentioned in the Philosophical Transactions, which spread through Swisserland, Germany, into Poland, &c.

The contagion seemed to propagate itself in form of a blue mist, which fell on the grass where the cattle grazed, when whole herds, forbearing their food, almost died away in twenty-four hours. Upon dissection were found large corrupted spleens, sphacelous and corroded tongues, &c. And even the persons who managed them were infected, and died like the beasts.

Some imagined it had its rise from noxious vapours thrown out of the earth, in three earthquakes perceived in the neighbourhood of the place where it began; though Dr. Slare thinks it rather owing to swarms of volatile insects.

The antidote for the sound, and medicine for the sick, was equal parts of soot, gunpowder, brimstone, and salt, with as much water as would wash it down: a spoonful was the dose.

The common signs of this disease are a hanging down of the head, gum at the eyes, as big as your finger, growing weakly, staggering, the head swelling very much, the breath short, the heart beating with rattling in the throat; and if you put your hand into the creature's mouth, and find his breath very hot, and his tongue shining, the distemper is very strong.

As soon as you find any of your cattle infected, take a pretty large quantity of blood from them immediately, and give them a drench. Madder root is highly commended for this distemper.

MUSHROOM, a genus of imperfect plants, composed of a pedicle crowned with a broad head, convex and smooth at the top; and hollow, foliated, lamellated, or pistulous underneath.

It is of the utmost importance to distinguish the right eatable sort, from several noxious kinds that have been productive of even fatal accidents: the true sort appear at first with a roundish head, not unlike to a button. The outside of this head is then very white, as is likewise the stalk on which it grows; but its under part, when it is taken off that stalk, from which it separates pretty easily, is of a livid flesh colour. Its flesh is also very white within. If this sort remains undisturbed, its head will spread to a considerable size, and open at the bottom, so as to form an almost flat surface, the under part of which will then be changed to a dark colour.

Most of the writers upon gardening have spoken so confusedly, not to say, of most of them, so unintelligibly, of the means of propagating this plant, that excepting the authors of the *Maison Rustique*, and Mr. P. Miller, one is sometimes puzzled to guess at their meaning. The account which this last has given in his Dictionary, is the most practical, being the method of the gardeners near London, who raise annually great quantities of mushrooms for sale. The substance of it is to the following effect.

The spawn of mushrooms, from which only they are propagated, looks like a white mouldiness shooting out in long strings. It is frequently found among the dung of old hot-beds, or in old dunghills, especially when much litter has been mixed with these last, or the wet has not penetrated so as to rot it; or it may be procured by mixing some long stable dung, which has not been thrown up in a heap to ferment, with strong earth, and then laying this mixture under cover, where it cannot be wet, and where the air may be excluded from it as much as possible; for, the more effectually it is kept from air, the sooner the spawn will be produced. It will generally appear in about two months, if the heap has not been laid so close together as to heat (for that will destroy the spawn) and especially if it has been well covered with old thatch, or litter which has lain so long abroad as to have lost the power of fermenting. These are expedients by which the spawn of mushrooms may be procured at almost any time, by those who have not already had mushroom-beds in their gardens, and therefore cannot collect it from their remains: for there are but two months of the year in which it can be gathered from downs or pastures. These are August and September; when plenty of mushrooms spring up naturally in many of those places. To propagate them from thence, the ground should be opened about their roots, and such earth as is there found full of small white knobs, which are the offsets, or young mushrooms, should be attentively gathered up, with as much care as can be not to break the lumps, or the earth about them. This seed, or rather this spawn (for if mushrooms have seeds, they are imperceptible to the eye) should be kept very dry till it is used; for the drier it is, the better it will take to the bed, as has been remarkably experienced by Mr. Miller, who declares, that he never saw these plants produced so soon, or in so great quantity, as from a parcel of their spawn which had lain near the oven of a stove for upwards of four months, and was become so dry, that he despaired of its success.

The beds for mushrooms should be made of dung plentifully intermixed with litter, but not thrown in a heap to ferment. The best dung for this purpose is that which has lain spread abroad for a month, or longer. Their breadth should be about two feet and an half at bottom, their length proportioned to the desired quantity of mushrooms, and they should be made on dry ground, by spreading upon it, first a layer of dung about a foot thick, and upon this about four inches deep of strong earth; then a couch of dung about ten inches thick, and upon that another layer of earth, contracting the surface of the bed all the way up, till it terminates like the ridge of a house. This may be done with three layers of dung, and as many of earth. When it is finished, it should be covered with litter, or old thatch, as well to prevent its drying, as to keep out wet, and after it has remained eight or ten days in this situation, it will be of a proper temperature to receive the spawn, for which its warmth should be but moderate. The thatch, or litter, ſhould then be taken off, the ſides of the bed ſhould be ſmoothed, and a covering of light rich earth, by no means wet, ſhould be laid all over it, about an inch thick. Upon this the ſpawn ſhould be placed, by laying its lumps about two or three inches aſunder, in ſuch manner as to prevent their ſlipping down, and then the whole ſhould be covered gently with about half an inch thick of the ſame light earth as was uſed before. The covering of litter ſhould then be replaced over the bed, ſo thick as to ſecure it from wet, and to prevent its drying. If theſe beds are made in the ſpring or autumn, when the weather is temperate, the muſhrooms will frequently come up in a month's time: but thoſe which are made in ſummer, when the ſeaſon is hot, or in winter, when it is cold, will not produce them near ſo ſoon. Sometimes too it happens that neither of theſe beds, but moſt particularly thoſe made in the ſummer or winter, yield any muſhrooms before the end of five or ſix months; and that they then produce uncommon quantities, and continue in perfection for a long time.

The great art in managing of theſe beds is, to keep them conſtantly in a due degree of moiſture, and, above all, not to ſuffer them ever to receive too much wet; for that would inevitably deſtroy the ſpawn of the muſhrooms. During the ſummer, they may be uncovered, to admit gentle ſhowers of rain to them at proper times; and if the weather continues dry for a long while together, it will be right to water them gently now and then, but by no means to overdo it. During the winter, they muſt be kept as dry as poſſible, and cloſely covered, leſt the cold air of the ſeaſon ſhould injure them. It will even be right in froſty or very cold weather, to lay over them a covering of dry litter, for it muſt not incline to ferment, and upon that ſome warm litter ſhaken from out of a heap of dung. This covering ſhould alſo be renewed as often as it is found to decay, and, if the cold grows more ſevere, its thickneſs ſhould be increaſed.

The muſhrooms thus produced have a finer flavour than any that are gathered in the fields; and if the above directions are obſerved, they may be had in plenty during the whole year: for each ſingle bed will continue good for ſeveral months, and yield great quantities if the ſpawn takes kindly.

When theſe beds are deſtroyed, the ſpawn for a freſh ſupply ſhould be taken from them, and laid up in a dry place till the proper ſeaſon for uſing it, which ſhould not be ſooner than five or ſix weeks, in order that it may have time to dry well, before it is put into the new bed; for otherwiſe there will be ſome danger of its ſucceeding.

MUST, new wine, or wort, before it is fermented.

MUSTARD is an annual plant raiſed from its ſeed only. The white muſtard, as it is commonly called, is the ſort chiefly cultivated in gardens, for a ſallad herb in the winter and ſpring. The ſeeds of this are ſown very thick in drills, either upon a border warmly ſituated, or if the weather be very cold, upon a gentle hot-bed, in the ſame manner as creſſes and other ſmall ſallading, and in about ten days or a fortnight after the time of ſowing, the plants will be fit for uſe; for when they are large and have rough leaves, they are too ſtrong to be mixed with ſallads.

The beſt way to ſave the ſeeds of this plant, is to ſow a ſpot of ground with it in the ſpring, to thin the plants when they have about four leaves, and at the ſame time to hoe down the weeds, as is practiſed for turnips. This hoeing is to be repeated in about a month after, and the plants are then to be left about eight or nine inches aſunder, which will be a ſufficient ſpace for the growth of this ſpecies. If theſe hoeings are well performed, in dry weather, they will keep the ground clean till the muſtard ſeeds are ripe. The ſtalks of this plant, which are branched and hairy, will then be about two feet high, and the ripening of its ſeed is indicated by the pods changing to a brown colour; immediately after which they ſhould be cut down, dried upon cloths, for two or three days, and then threſhed out for uſe.

The larger ſorts of muſtard, the ſeeds of which are uſed chiefly for ſauce, are to be treated in the ſame manner; excepting that, as they grow much larger, a proportionably greater ſpace muſt be left between their plants; and as their ſeeds will not ripen ſo ſoon as thoſe of the ſmaller kind, three hoeings, or rather good deep ſtirrings, of the ground may be requiſite for them. One of theſe large ſorts, which is the common muſtard, grows naturally in many parts of England; but is cultivated in the fields for its ſeeds, of which the ſauce called muſtard is made; and another ſort, which naturally grows in our arable lands, and is alſo cultivated for uſe, produces the ſeeds which are commonly ſold under the appellation of Durham muſtard-ſeed. The ſtalks of the laſt ſort ſeldom riſe above two feet high; but thoſe of the former generally run up to the height of four or five feet.

N.

NAIL, or *Naile*, the weight of eight pounds.

NAPE, or *Neap*, a piece of wood with two or three feet, with which they fupport the fore-part of a loaded wain.

NASTURTIUM. *See the article* CRESS.

NAVE *of a Wheel*, is that fhort thick piece in the center of the wheel, which receives the end of the axletree, and in which the ends of the fpokes are fixed; it is bound at each end with hoops of iron, called the nave-bands; it has likewife, in each end of the hole, through which the end of the axletree goes, a ring of iron, called the wifher, which faves the hole of the nave from wearing too big.

NEAT, black cattle, oxen.

NEAT-HERD, a herd or company of black cattle: alfo a perfon who looks after horned cattle.

NECTARINE, a fruit greatly efteemed for its delicious flavour, and fuppofed to have its name from the nectar of the gods, in heathen ftories.

It differs in nothing from the peach, but in having a fmoother fkin, and a firmer pulp. *See* PEACH.

We have ten kinds of nectarines cultivated by the curious in gardening.

1. Fairchild's early nectarine; this is a fmall fruit of a red colour, and very well tafted, and ripens in July, the earlieft of all this kind.

2. The Elruge nectarine; this is a larger fruit of a purple colour, on that fide which was towards the fun, and of a greenifh yellow on the other parts. This is a very well flavoured nectarine, of a foft, melting juice, and parts from the ftone: it ripens towards the end of July.

3. The Newington nectarine; this is a fair large fruit, of a fine red toward the fun, and of a yellowifh green towards the wall. It has a very rich juice, but the pulp adheres to the ftone: this ripens in Auguft.

4. The fcarlet nectarine; this is of a fine glowing red towards the fun, and of a pale red towards the wall; it ripens in the end of July.

5. The Brugnon, or Italian nectarine; this is a fair, large fruit, of a deep red next the fun, but of a foft yellow next the wall. The pulp is firm, and of a rich flavour, but clofely adheres to the ftone, and is red in that part: this ripens in the middle of Auguft.

6. The Roman red nectarine; this is a fair large fruit, of a deep purple towards the fun, and of a greenifh yellow next the wall. The pulp is very firm and well tafted, but it is red about the ftone, and adheres firmly to it: this is ripe in the middle of Auguft.

7. The murry nectarine; this is a middle-fized fruit, of a dirty red next the fun, and of a greenifh yellow next the wall. The pulp is tolerably well flavoured, and ripens in the middle of Auguft.

8. The golden nectarine; this is a fair handfome fruit, of a foft red next the fun, but of a gold yellow next the wall; and its pulp is very yellow, but of a faint red about the ftone, to which it adheres: it is a very well flavoured kind, and ripens at the end of September.

9. Temple's nectarine; this is a very fine kind; it is of a foft red towards the fun, and of a yellowifh green next the wall. It parts from the ftone, and is of a very rich flavour; the pulp is white in other parts, but yellowifh about the ftone: this ripens in the middle of September.

10. The Peterborough nectarine, called by fome the late green nectarine; this is a middle-fized fruit, of a pale green colour towards the fun, and of a whitifh green toward the wall; the pulp is firm, and well flavoured: it ripens towards the end of September.

Nectarine trees generally produce their fruit either upon the young wood of the preceding year, or, at moft, upon fhoots of two years old, and thefe ceafe to bear after that age. The branches of thefe trees muft therefore be fhortened, according to their ftrength, in order to make them put out annually new fhoots for the fucceeding year. When the knife is ufed for pruning them, care fhould always be taken to cut them a little floping behind a wood bud, which may be eafily diftinguifhed from the bloffom buds; thefe laft being fhorter, rounder, and more turgid than the former; for if the fhoot have not a leading bud where it is cut, it is very apt to die down to the next leading bud. This leading bud, or wood-bud, is always neceffary, to preferve a circulation of the juices in the branch. The length at which the pruned fhoots are left, fhould be proportioned to the ftrength of the tree: thus, in a healthy ftrong tree it may be ten inches, or more; but in a weak one, it fhould not exceed fix inches: however, this muft alfo be determined, in fome meafure, by the pofition of a fine wood bud; for it is better to leave a fhoot three or four inches longer, or to cut it two or three inches fhorter, than one might otherwife choofe to do, for the fake of fuch a bud; it being abfolutely neceffary for the future welfare of the tree. It is alfo neceffary to cut out entirely all weak fhoots, though there may be many bloffoms upon them; for thefe have not ftrength enough to nourifh the fruit, but will weaken the other parts of the tree. It is to the neglecting of this, and to the not difplacing of all luxuriant fhoots as foon as they are produced, that half the blights we hear complained of are (though wrongly termed, and miftaken as to the caufe) in Mr. Miller's opinion, owing.

In nailing the fhoots to the wall, care muft be taken to place them, as nearly as poffible, at equal diftances, in order that their leaves, when come out, may have room to grow, without fhading the branches too much. So far as the nature of the tree will permit, they fhould never be nailed upright, becaufe they are very apt to fhoot from the

the uppermoſt eyes, and the lower parts of the ſhoots become thereby naked, when they are trained in that manner.

When the fruit is ſet, and grown to the bigneſs of a ſmall nut, it ſhould be looked over, and thinned ſo as to be left at leaſt five or ſix inches aſunder; for no tree can afford ſufficient nouriſhment to perfect ſo great a crop as it ſometimes produces; and it is evidently better to pull off early ſuch fruits as over-burden it, and therefore are not to remain on the tree, than to let them impoveriſh the reſt by ſtanding longer; eſpecially as, in this laſt caſe, the tree itſelf is frequently ſo weakened thereby, as to be diſabled from bearing well for three or four years after.

If the ſeaſon ſhould prove hot and dry, it will be proper to draw the earth round the ſtem of each tree, ſo as to form a baſon of about ſix feet diameter, to cover the ſurface of the ground in the baſon with mulch, and once in a week or fortnight, according to the heat and drought of the ſeaſon, to pour down eight or ten gallons of water to the root of the tree: or where there is an engine, which will diſperſe the water in eaſy gentle drops like rain, if the ſame, or a larger, quantity of water is ſprinkled all over the branches of the trees, this ſoaking down to the roots, will keep the fruit conſtantly growing, and prevent its falling off the trees, as it is very apt to do where this method is not practiſed. The fruit thus conſtantly nouriſhed will alſo be much improved in its taſte, and the trees thus treated will be maintained in vigour. But this watering ſhould not be continued longer than while the fruit is growing; becauſe it will afterwards be hurtful to the trees and fruit; for a dry autumn ripens both wood and fruit better than a moiſt latter ſeaſon.

Mr. Miller, who recommends this practice from his own long and extenſive experience, blames, upon the authority of the ſame unerring guide, the too frequent cuſtom of pulling off the leaves of the trees, in order to admit the ſun to the fruit; becauſe, as the leaves are abſolutely neceſſary to cheriſh the bloſſom buds, which are always formed at their footſtalks, theſe buds muſt be greatly injured by pulling off the leaves before they have performed the office aſſigned them by nature.

After diſproving the common opinion, that theſe trees are not long lived, and that they ſhould therefore be renewed every twenty years, by declaring that he has eaten ſome of the fineſt peaches of various kinds, which grew on trees upwards of fifty years old, and then aſcribing this miſtaken notion to the wrong practice of the French, who generally bud their peaches upon almond ſtocks, which are of ſhort duration; he recommends dunging the borders where fruit trees grow, every other year, with well rotted dung dug into the ground in November, that the rain may waſh down its fertilizing particles before the ſpring comes on: and to confirm this opinion, he inſtances the practice of the gardeners at Montreuil, near Paris, who have for ſome generations been famous for this practice, and are as careful to dung the borders where their peach trees grow, every other year, as the kitchen-gardeners are for their legumes. He thinks neats or hogs dung, mixed with loam, ſix or eight months before it is uſed, and mellowed by frequent turning during that time, the beſt for a looſe or ſandy ſoil, becauſe this dreſſing is cooler than any that is made with horſe-dung; and he thinks this laſt, mixed with light ſandy earth, or ſea-coal aſhes, the moſt proper for ſtrong land.

NETTLE, the name of a weed well-known, and which may be eaſily deſtroyed by cutting the roots, before the plant has perfected its ſeed.

NEWING, yeaſt, or barm.

NICKING, the name of an operation often performed on the tails of ſaddle-horſes, and by which means they carry them in a more beautiful manner.

Before we deſcribe the operation of nicking, it may be neceſſary to enquire how the effect of it (the elevation of the tail) is brought about; and in order to know this, and judge with propriety of the operation, we muſt conſider the tail as elevated, or lifted up, by one ſet of muſcles, and depreſſed or pulled down by another.

It is ſomewhat remarkable, that Snape, Saunier, and Gibſon, who are in general pretty exact in their anatomical deſcriptions, ſhould omit, in their account of the muſcles of a horſe, to deſcribe thoſe of the tail: for which reaſon, as a proper opportunity has not offered, to ſupply this omiſſion, by making a complete diſſection, with that accuracy we could have wiſhed, it is hoped the ſubſequent imperfect deſcription will be excuſed, as it was taken only from a tail that was diſſected after docking.

Here we obſerved, that the muſcles which elevate the tail, are more numerous, large, and ſtrong, than thoſe that depreſs it; that they are cloſely connected to the bones of the tail by fleſhy fibres, and terminate in ſtrong tendons at the extremity: but the muſcles of the latter ſoon form into tendinous expanſions, and three large tendons, which are inſerted into the latter bones of the tail: there are ſeveral other ſmall tendons, which run laterally, whoſe uſe moſt probably is to move the tail ſideways. The arteries are four in number, and run ſometimes above the bones of the tail, conſequently eaſily avoided by a dextrous hand, as they cannot readily be wounded by the knife, in dividing the tendons neceſſary to be cut in this operation.

The art of nicking horſes then chiefly conſiſts in a tranſverſe diviſion of theſe depreſſing tendons of the tail, and ſuch a poſition afterwards as will keep their extremities from coming again into contact; ſo that an intervening callus fills up the vacuity: by theſe means an additional power is given to the antagoniſt muſcles, viz. the elevators; the counteraction of the depreſſors being manifeſtly abated by the diviſion of the tendons, and the intervention of the callus.

The uſual method of ſupporting the tail by a pulley and weight, is liable to many exceptions, the extremities of the divided tendons not being by that method kept ſufficiently aſunder; the ſituation of the tail being rather inclined to a perpendicular than a curved direction: this poſition too is liable to many variations, from the different movements of the horſe, and is the reaſon that the tail frequently inclines to one ſide, as the nick may heal up faſter on one ſide than the other; the diſagreeable ſituation the horſe muſt ſtand in, with a weight conſtantly hanging to his tail, is another material objection, beſides the neceſſity of removing it when the horſe is exerciſed, or taken out to water.

To remedy theſe inconveniencies, and perfect this operation, a very ingenious gentleman, who had thoroughly conſidered it, has been ſo kind as to favour us with a draught and deſcription of a machine he contrived for that purpoſe, which has frequently been practiſed with the expected ſucceſs, and indeed at firſt view appears in every reſpect calculated to correct all the defects in the old one: as we doubted not its reception being perfectly agreeable to the public, we have ordered a plate to be engraved, which, with the annexed deſcription, will, we hope, make it very familiar and intelligible to every capacity.

In regard to the operation, it is worth notice, that the extremities of the tendons, which jut out in the operation, need not here be cut off, as is cuſtomarily done; the number of the inciſions muſt be in proportion to the length of the tail, but three in general are ſufficient. The moſt approved method of dreſſing at firſt, is with powdered roſin, and ſpirit of wine, applying a ſoft doſſil of lint or tow, dipped in the ſame, between each nick, and lapping the tail up with a linnen cloth and broad fillet; which the next morning ſhould be cut open down the back part of the tail, and the morning after be gently taken off: when it will be proper to plat the hairs, in order to keep them clean, and to ſet the tail, as will be directed in the plate and references.

Every two or three days, the tail ſhould be let down, and the upper part next the rump bathed with hot vinegar; and if it begins to crack, and the hair comes off, a little tincture of myrrh will ſoon put a ſtop to it. To obviate any threatening ſymptoms that may ariſe in regard to the wounds, have recourſe to the remedies uſed on docking.

After ſix or eight days, it will be proper to let the horſe ſtand without the machine for a few hours, and then be rode about, in order to obſerve how he carries his tail; by which means you will the better judge how to faſten it down, whether to confine it cloſer, or give it more ſcope: after the wounds are healed up, it may be neceſſary to keep

keep the tail fufpended, till the callus is confirmed, at leaft for fome hours in the day; though a greater liberty may now be allowed it.

Thus this machine anfwers every intention, is far preferable to the pulley, as it keeps the tendons properly feparated, and the tail in a certain pofition; fo that the wounds heal up uniformly, without any rifk of its being caft to one fide; the horfe alfo is more at eafe, having no weight conftantly pulling and teazing him, and may be taken out to water or exercife without any inconveniency, or difturbance.

Directions for the Application of the Nicking Machine; and Explanation of the Plates.

When the hair of the tail is properly platted, and tied with a knot or two at the end, the pad, &c. as defcribed in Plate XX. Fig. 9. muft be put on, and the machine, as in Fig. 10. buckled to them, letting the part G. in the machine lie over the part of the tail that joins to the horfe's rump; then let an affiftant, ftanding on the fide rail of the brake, or any other conveniency that may place him above the horfe, raife the horfe's tail very gently, till the knot of the tail gets fo far beyond the ftrings L L in Fig. 10. that it may be tied down; which being done, the tail may be let down lower, or taken up higher at pleafure. It is to be obferved, that the ligature is not made on the tail itfelf, but on the plated hair, at the extremity of the ftump.

The machine, Fig. 10. muft be made of a piece of tough wood, about a foot long, viz. from A to B, and about nineteen inches broad from C to D, and feven or eight inches thick. The under part muft be hollowed, fo as to let in the horfe's rump, and that the wings C D may reft on his buttocks. To receive the tail, a groove muft be cut from G to H, about three inches wide, and three deep at G, leffening gradually both in height and breadth to H. Holes muft be made at certain diftances in the groove, as at H for the ftring, and a nick cut to receive the billet from the ftrap K. Two buckles fixed to the machine as at I I.

The pad, &c. are fufficiently defcribed in Fig. 9. and its references; the wood muft be floped off from E to C and A, and fo on the other fide, to lighten the machine, and hollowed at B, G, and F.

Fig. 9. reprefents a horfe, with his tail in the frame or machine. A is a pad, to which is faftened a circingle B. C C two fide ftraps, one on each fide the horfe, faftened to the circingle, to keep the machine from going to either fide; D, a breaft-plate, to prevent the pad, &c. flipping back. E, a ftrap fixed to the pad, and buckling to the machine, to keep the tail on the ftretch at pleafure. F, the ftring tied on the hair, to confine the tail down to the machine.

Fig. 10. from A to B is twelve inches; from C to D, meafured with a ftring drawn over E F, is nineteen inches. From the top of the groove at E to the bottom G, is three inches. From E to F, the wideft part of the groove, is three inches, gradually narrowing, as a tail leffens to its extremity. The dots about H are holes in the groove, through which a piece of tape or pack-thread muft be put, according to the length of the dock, and the diftance of the knot, to tie the tail down behind the knot. I I, the buckles to receive a ftrap from the circingle on each fide, as defcribed in Fig. 9. which keeps the machine from turning to either fide. K, the ftrap with a billet and buckle, which comes along the back from the pad, and is faftened to the machine, through a nick cut juft above H. L L, the ftrings to tie down the tail. B, G, F, the hollow to let in the rump.

Fig. 2. reprefents the horfe with the machine on, ftanding directly before you, where the depth of it is fhewn, being three inches.

C D, the extremities of the wings. E F, the upper part. *Bartlet's Farriery, page* 325.

NIGHT-FALL, the beginning of night.

NOPE, a bull finch, or red-tail, a fmall finging bird, well known.

NURSERY, or NURSERY GARDEN, a piece of land fet apart for the raifing and propagating of all forts of trees and plants, to fupply the garden and other plantations.

Of this fort there are great numbers in the different parts of this kingdom, but particularly in the neighbourhood of London, which are occupied by the gardeners, whofe bufinefs it is to raife trees, plants, and flowers for fale; and in many of thefe there is at prefent a much greater variety of trees and plants cultivated than can be found in any other part of Europe. In France, their nurferies (which are but few, when compared with thofe in England) are chiefly confined to the propagation of fruit-trees, from whence they have the appellation of pepinier: for there is fcarce any of thofe gardens, where a perfon can be fupplied either with ever-greens, flowering fhrubs, or foreft-trees. And in Holland, their nurferies are principally for flowers; fome few of them indeed propagate tender exotic plants. But thofe nurferies in the neighbourhood of London do, feveral of them, include all thefe; and from hence moft of the curious perfons abroad are fupplied with furniture for their gardens. But we do not propofe, in this place, to treat of thefe extenfive nurferies, or to give a defcription of them; therefore fhall confine ourfelves to treat of fuch nurferies only as are abfolutely neceffary for all lovers of planting to have upon the fpot, where they defign to make their plantation: for if thefe are large, the expence of carrying a great number of trees, if the diftance is greet, will be no fmall article, befides the hazard of their growing; which, when plants have been trained up in good land, and removed to an indifferent one, is very great. Therefore it is of the utmoft confequence to every planter, to begin by making of a nurfery. But in this article we muft beg leave to obferve, that a nurfery fhould not be fixed to any one particular fpot: we mean by this, that it would be wrong to continue the raifing of trees any number of years upon the fame fpot of ground: becaufe hereby the ground will be fo much exhaufted by the trees, as to render it unfit for the fame purpofe. Therefore all good nurfery-gardeners fhift and change their land, from time to time; for when they have drawn off the trees from a fpot of ground, they either plant kitchen herbs, or other things, upon the ground for a year or two, by which time, as alfo by dunging and trenching of the land, it is recovered, and made fit to receive other trees. But this they are obliged to from neceffity, being confined to the fame land; which is not the cafe with thofe gentlemen, who have a large extent of ground in the country. Therefore all fuch perfons we would advife to make nurferies upon the ground which is intended for planting, where a fufficient number of the trees may be left ftanding, after the others have been drawn out, to plant in other places; which, for all large growing trees, but particularly fuch as are cultivated for timber, will be found by much the moft advantageous method: for all thofe trees which come up from the feed, or which are tranfplanted very young into the places where they are defigned to remain, will make a much greater progrefs, and become larger trees than any of thofe which are tranfplanted at a greater age. Therefore the nurferies fhould be thinned early, by removing all thofe trees which are intended for other plantations, while they are young; becaufe hereby the expence and trouble of ftaking, watering, &c. will be faved, and the tree will fucceed much better. But in expofed fituations, where there are nurferies made, it will be neceffary to permit the trees to ftand much longer, that, by growing clofe together, they may fhelter each other, and draw themfelves up: and thefe fhould be thinned gradually, as the trees advance; for by taking away too many at firft, the cold will check the growth of the remaining trees. But then thofe trees which are taken out from thefe nurferies, after a certain age, fhould not be depended on for planting; and it will be prudence rather to confign them for fuel, than by attempting to remove them large, whereby, in endeavouring to get them up with good roots, the roots of the ftanding trees will be often much injured.

What has been here propofed, muft be underftood for all large plantations in parks, woods, &c. but thofe nurferies which are only intended for the raifing of evergreens, flowering fhrubs, or plants which are defigned to embellifh embellish gardens, may be confined to one ſpot, becauſe a ſmall compaſs of ground will be ſufficient for this purpoſe. Two or three acres of land, employed this way, will be ſufficient for the moſt extenſive deſigns; and one acre will be full enough for thoſe of moderate extent. And ſuch a ſpot of ground may be always employed for ſowing the ſeeds of foreign trees and plants; as alſo, for raiſing many ſorts of biennial and perennial flowers, to tranſplant into the borders of the pleaſure garden; and for raiſing many kinds of bulbous-rooted flowers from ſeeds, whereby a variety of new ſorts may be obtained annually, which will recompenſe for the trouble and expence, and will moreover be an agreeable diverſion to all thoſe perſons who delight in the amuſements of gardening.

Such a nurſery as this ſhould be conveniently ſituated for water; for where that is wanting, there muſt be an expence attending the carriage of water in dry weather. It ſhould alſo be as near the houſe as it can with conveniency be admitted, in order to render it eaſy to viſit at all times of the year; becauſe it is abſolutely neceſſary, that it ſhould be under the inſpection of the maſter; for unleſs he delights in it, there will be little hopes of ſucceſs. The ſoil of this nurſery ſhould alſo be good, and not too heavy and ſtiff; for ſuch land will be very improper for ſowing moſt ſorts of ſeeds; becauſe, as this will detain the moiſture in the ſpring and winter, ſo the ſeeds of moſt tender things, eſpecially of flowers, will rot in the ground, if ſown early. Therefore, where perſons are confined to ſuch land, there ſhould be a good quantity of ſand, aſhes, and other light manures buried, in order to ſeparate the parts, and pulveriſe the ground; and if it is thrown up in ridges, to receive the froſt in winter, it will be of great uſe to it; as will alſo the frequent forking or ſtirring of the ground, both before and after it is planted.

The many advantages which attend the having ſuch a nurſery, are ſo obvious to every perſon who has turned his thoughts in the leaſt to this ſubject, that it is needleſs for us to mention them here; and therefore we ſhall only beg leave to repeat here what we have frequently recommended, which is, the carefully keeping the ground always clear from weeds; for if theſe are permitted to grow, they will rob the young trees of their nouriſhment. Another principal buſineſs is, to dig the ground between the young plants at leaſt once a year, to looſen it for the roots to ſtrike out; but if the ground is ſtiff, it will be the better to be repeated twice a year, viz. in October and March; which will greatly promote the growth of the plants, and prepare the roots for tranſplanting.

The ground you intend for the flower nurſery ſhould be well ſituated to the ſun, but defended from ſtrong winds by plantation of trees, or buildings; and the ſoil ſhould be light and dry, which muſt always be obſerved, eſpecially for bulbous-rooted flowers, which are deſigned to be planted therein.

In this nurſery ſhould be planted the off-ſets of all your bulbous-rooted flowers, where they are to remain, until they become blowing roots; when they ſhould be removed into the pleaſure garden, and planted either in beds or borders, according to the goodneſs of the flowers, or the management they require.

You may alſo, in this ground, raiſe the ſeveral ſorts of bulbous-rooted flowers from ſeeds, by which means new varieties may be obtained; but moſt people are diſcouraged from ſetting about this work, from the length of time before the ſeedlings will come to flower: however, after a perſon hath once begun, and conſtantly continued ſowing every year, after the parcel firſt ſown has flowered, the regular ſucceſſion of them, coming annually to flower, will not render this method ſo tedious as it at firſt appeared.

The ſeedling auriculas, polianthus's, anemonies, carnations, &c. ſhould be raiſed in this nurſery, where they ſhould be preſerved until they have flowered; when you ſhould mark all ſuch as are worthy of being tranſplanted into the flower garden; which ſhould be done in their proper ſeaſons: for it is not ſo well to have all theſe ſeedling flowers expoſed to public view in the flower garden; becauſe it always happens, that there are great numbers of ordinary flowers produced among them, which will make but an indifferent appearance in the pleaſure garden. *Miller's Gard. Dict.*

NUSHED, ſtarved in bringing up.

OAK,

O.

OAK, a tree well known, and one of the principal materials in building ſhips, &c. being ſtrong in all poſitions.

All the ſorts of oaks are propagated from acorns, which ſhould be ſown as ſoon as poſſible after they are ripe; for if they are kept too long out of the ground, they ſeldom grow.

The manner of ſowing theſe acorns, if deſigned for a ſmall plantation, or to be removed, is, to prepare ſome beds of freſh earth, neither too ſtrong and heavy, nor too light and dry; in theſe beds you ſhould place the acorns in rows one foot aſunder, and about two inches diſtance in the rows, covering them about two inches thick with the ſame freſh earth; obſerving to leave none of them uncovered, to entice the vermin, which may, in a ſhort time, deſtroy all the ſeeds.

In the ſpring, when the plants begin to appear, you muſt carefully clear them from weeds; and if the ſeaſon proves dry, you ſhould refreſh them now and then with a little water, which will greatly promote their growth. In theſe beds the plants ſhould remain until the following autumn, obſerving conſtantly to keep them clear from weeds; at which time you ſhould prepare a ſpot of good freſh earth, in ſize proportionable to the quantity of plants, which ſhould be trenched and levelled: then towards the middle or latter end of October, you ſhould carefully take up the plants, ſo as not to injure their roots, and plant them out in rows three feet aſunder, and eighteen inches diſtance plant from plant; obſerving never to ſuffer the plants to abide long out of the ground, becauſe their roots would dry, and endanger the growth of the plants.

When they are planted, you ſhould lay a little mulch upon the ſurface of the ground, near their roots, to prevent the earth from drying too faſt; and if the ſeaſon ſhould prove very dry, you ſhould give them a little water to ſettle the earth to their roots.

When the plants have taken root in this nurſery, they will require little more care than to keep them clear from weeds, and dig the ground between the rows every ſpring; in doing of which, you ſhould cut off ſuch roots as extend very far from the trunk of the trees, which will render them better for tranſplanting again: you ſhould alſo prune off ſuch ſide-branches as extend themſelves very far, and would retard the upright ſhoot; but you ſhould by no means cut off all the ſmall lateral branches, ſome of which are abſolutely neceſſary to be left on, to detain the ſap for the augmentation of the trunk; for I have often obſerved, where trees have been thus cloſely pruned, that their heads have over-grown their bodies, ſo that they have bent downward and become crooked.

When theſe trees have remained in the nurſery three or four years, they will then be large enough to tranſplant to the places where they are to remain; for it is not proper to let them grow very large before they are planted out; becauſe theſe are very hazardous trees to remove when old, or after they have taken deep root.

The ſeaſon for this work is, as I ſaid before, in the autumn; at which time, if they are carefully taken up, there will be little danger of their ſucceeding. When they are planted, the ſurface of the ground ſhould be mulched about their roots, to prevent its drying too faſt; and if the ſeaſon is very dry, they ſhould be watered, to ſettle the earth to their roots, which may be repeated two or three times in very dry weather; but you muſt carefully avoid giving them too much water, which is very injurious to theſe trees, when newly removed.

You ſhould alſo ſtake them to prevent their being ſhaken and diſturbed by the winds, which would retard their rooting. In tranſplanting of theſe trees, you ſhould by no means cut their heads, which is too much practiſed: all that ſhould be done, muſt be only to cut off any bruiſed or ill-placed branches, which ſhould be taken off cloſe to the place where they are produced: but there can be no greater injury done to theſe trees than to ſhorten their roots; for when the leading bud, which is abſolutely neceſſary to draw and attract the nouriſhment, is taken off, the branch often decays entirely, or, at leaſt, down to the next vigorous bud.

The trees, thus raiſed and managed, will, if planted in a proper ſoil, grow to a conſiderable magnitude, and are very proper for a wilderneſs in large gardens, or to plant in clumps in parks, &c. but if they are deſigned for timber, it is much the better method to ſow the acorns in the places where they are to remain; in order to which, you ſhould provide yourſelf in autumn with a ſufficient quantity of acorns, which ſhould be always taken from ſtraight, upright, vigorous-growing trees; theſe ſhould be gathered from under the trees as ſoon as may be after they are fallen, and, if poſſible, in a dry time, laying them thin in ſome open room to dry; after which they may be put in dry ſand, and preſerved in a dry place until the end of November, when you ſhould prepare the ground for planting them.

The directions here given are deſigned only for ſmall plantations in a garden or park, which are only for pleaſure: but where theſe trees are cultivated with a view to profit, the acorns ſhould be ſown where the trees are deſigned to grow; for thoſe which are tranſplanted will never grow to the ſize of thoſe which ſtand where they are ſown, nor will they laſt near ſo long ſound: for in ſome places, where theſe trees have been tranſplanted with the greateſt care, and they have grown very faſt for ſeveral years after, yet they are now decaying, when thoſe which remain in the place where they came up from the acorns, are ſtill very thriving, and have not the leaſt ſign of of decay: therefore, whoever designs to cultivate these trees for timber, should never think of transplanting them, but sow the acorns on the same ground where they are to grow; for the timber of all those trees which are transplanted, is not near so valuable as that of the trees from acorns. I shall therefore add some plain directions for the sowing of acorns, and managing of the young trees, during their minority, until they are out of danger, and require no farther care.

The first thing to be done is that of fencing the ground very well, to keep out cattle, hares, and rabbits; for if either of these can get into the ground, they will soon destroy all the young trees. Indeed, they will in a few years grow to be out of danger from the hares and rabbits; but it will be many years before they will be past injury from cattle, if they are permitted to get into the plantation; therefore, durable fences should be put round the ground. If, in the beginning, a pale fence is made about the land, which may be close at the bottom, and open above; and within the pale a quick-hedge planted; this will become a good fence, by the time the pale decays, against all sorts of cattle; and then the trees will have got above the reach of hares and rabbits, so that they cannot injure them; for the bark of the trees will be too hard for them to gnaw.

After the ground is well fenced, it should be prepared, by ploughing of it three or four times, and, after each ploughing, to harrow it well, to break the clods, and cleanse the ground from couch, and the roots of all bad weeds. Indeed, if the ground is green sward, it will be better to have one crop of beans, pease, or turnips, off the ground, before the acorns are sown, provided these crops are well hoed to stir the surface, and destroy the weeds: for if this is observed, the crop will mend and improve the land for sowing; but in this case the ground should be ploughed as soon as possible, when the crop is taken off, to prepare it for acorns; which should be sown as soon as may be after the acorns are ripe: for although these may be preserved in sand for some time, yet they will be apt to sprout; and, if so, the shoots are in danger of being broken and spoiled; therefore we would advise the sowing early, which is certainly the best method.

In making choice of the acorns, all those should be preferred which are taken from the largest and most thriving trees: and those of pollard-trees should always be rejected, though the latter are generally the most productive of acorns; but those of the large trees commonly produce the strongest and most thriving plants.

The season for the sowing of the acorns being come, and the ground having been ploughed, and levelled smooth, the next work is to sow the acorns; which must be done by drawing of drills across the ground, at about four feet asunder, and two inches deep; into which the acorns should be scattered, at two inches distance. These drills may be drawn either with a drill-plough, or by hand, with an hoe; but the former is the most expeditious method, therefore in large plantations should be preferred. In the drawing of the drills, if the land has any slope to one side, these should be made the same way as the ground slopes, that there may be no stoppage of the wet by the rows of plants crossing the hanging of the land. This should be particularly observed in all wet ground, or where the wet is subject to lie in the winter. When the acorns are sown, the drills should be carefully filled in, so as to cover the acorns securely; for, if any of them are exposed, they will entice the birds and mice; and if either of these once attack them, they will make great havock with them.

The reason of my directing the drills to be made at this distance, is for the more convenient stirring of the ground between the rows, to keep the young plants clean from weeds; for if this is not carefully done, it cannot be expected, that the young plants should make much progress; and yet this is generally neglected by many who pretend to be great planters, who are often at a large expence to plant, but seldom regard them after: so that the young plants have the difficulty to encounter the weeds, which frequently are four or five times the height of the plants, and not only shade and draw them, but also exhaust all the goodness of the ground, and consequently starve the plants: therefore, whoever hopes to have success in their plantations, should determine to be at the expence of keeping them clean for eight or ten years after sowing, by which time the plants will have obtained strength enough to keep down the weeds: the neglecting of this has occasioned so many young plantations to miscarry, as are frequently met with in divers parts of England.

About the end of March, or beginning of April, the young plants will appear above ground; but before this, if the ground should produce many young weeds, it will be good husbandry to scuffle the surface over with Dutch hoes, in a dry time, either the latter end of March, or the beginning of April, to destroy the weeds, whereby the ground will be kept clean, until all the plants are come up so as to be plainly discerned; by which time it may be proper to hoe the ground over again; for by doing it early, while the weeds are small, a man will perform more of this work in one day than he can in three or four, when the weeds are grown large: besides, there will be great hazard of cutting off or injuring the young plants, when they are hid by the weeds; and small weeds, being cut, are soon dried up by the sun; but large weeds often take fresh root, and grow again, especially if rain should fall soon after, and then the weeds will grow the faster for being stirred; therefore, it is not only the best method, but also the cheapest husbandry, to begin cleaning early in the spring, and to repeat it as often as the weeds are produced.

The first summer, while the plants are young, it will be the best way to perform these hoeings by hand; but afterwards it may be done with the hoe-plough; for as the rows are four feet asunder, there will be room enough for this plough to work; and as this will stir and loosen the ground, it will be of great service to the plants; but there will require a little hand labour where the plough is used, in order to destroy the weeds, which will come up in the rows between the plants; for these will be out of the reach of the plough, and, if they are not destroyed, they will soon over-grow and tear down the young plants.

After the plants have grown two years, it will be proper to draw out some of them, where they grow too close; but in the doing of this, great care should be had not to injure the roots of those left; for as the plants which are drawn out are only fit for plantations designed for pleasure, so these should not be so much regarded in their being removed, as to sacrifice any of those which are designed to remain. In the thinning of these plantations, the plants may, at the first time, be left about one foot asunder, which will give them room enough to grow two or three years longer; by which time it may be easy to judge which are likely to make the best trees. Therefore these may be then fixed on, as standards, to remain; though it will be proper to have a greater number at this time marked than can be permitted to grow, because some of them may not answer the expectation: and, as it will be improper to thin these trees too much at one time, so the leaving double the number intended at the second thinning will not be amiss. Therefore, if they are then left at about four feet distance in the rows, they will have room enough to grow three or four years longer; by which time, if the plants have made good progress, their roots will have spread over the ground; therefore it will be proper to take up every other tree in the rows. But, by this, I do not mean to be exact in the removing, but to make choice of the best plants to stand, which ever rows they may be in, or if they should not be exactly at the distance here assigned: all that is designed here, is, to lay down general rules, which should be as nearly complied with as the plants will permit: therefore every person should be guided by the growth of the trees in the performance of this work.

When the plants have been reduced to the distance of about eight feet, they will not require any more thinning. But in two or three years time, those which are not to remain will be fit to cut down, to make stools for underwood; and those which are to remain, will have made such progress as to become a shelter to each other; for this is what should be principally attended to, whenever the trees are thinned; therefore, in all such places which are much exposed to the wind, the trees should be thinned with great caution, and by flow degrees; for if the air is let too much at once into the plantation, it will give a fudden check to the trees, and greatly retard their growth, but, in fheltered fituations, there need not be fo great caution ufed as in thofe places; the plants will not be in fo much danger of fuffering.

The diftance which I fhould chufe to allow to thofe trees which are defigned to remain for timber, is, from twenty-five to above thirty feet, which will not be too near, where the trees thrive well; in which cafe their heads will fpread, fo as to meet in about thirty, or thirty-five years: nor will this diftance be too great, fo as to impede the upright growth of the trees. This diftance is intended that the trees fhould enjoy the whole benefit of the foil. Therefore, after one crop of the underwood, or, at the moft, two crops are cut, I would advife the ftubbing up the ftools, that the ground may be intirely clear, for the advantage of the growing timber, which is what fhould be principally regarded: but, in general, moft people have more regard for the immediate profit of the underwood than the future good of the timber, and, frequently, by fo doing, fpoil both: for, if the underwood is left after the trees have fpread fo far as that their heads meet, the underwood will not be of much worth; and yet by their ftools being left, they will draw away a great fhare of nourifhment from the timber-trees, and retard them in their progrefs.

The foil in which oak makes the greateft progrefs, is a deep rich loam, in which the trees grow to the largeft fize; and the timber of thofe trees which grow upon this land, is generally more pliable than that which grows on a fhallower or drier ground; but the wood of the latter is much more compact and hard. Indeed there are few foils in England in which the oak will not grow, provided there is proper care taken in their cultivation; though this tree will not thrive equally in all foils: but yet it might be cultivated to a national advantage upon many large waftes in many parts of England, as alfo to the great profit of the eftates where thefe tracts of lands now lie uncultivated, and produce nothing to the owner. And, fhould the prefent temper of deftroying the timber of England continue in practice fome years longer, in the fame degree which it has for fome years paft, and as little care be taken to raife a fupply, this country, which has been fo long efteemed for its naval ftrength, may be obliged to feek for timber abroad, or be content with fuch a naval ftrength as the poor remains of fome frugal eftates may have left growing: for, as to the large forefts, from whence the navy has been fo long fupplied, a few years will put an end to the timber there: and how can it be otherwife, when the perfons to whofe care thefe are committed, reap an advantage from the deftruction of the timber? *Miller's Gard. Dict.*

OAK-BARK. *See the article* BARK *and* TAN.

OATS, the name of a well known fpecies of grain, and of which Mr. Miller reckons four forts, cultivated in England, viz. the white, the black, the brown or red, and the naked oat, in which, though fuppofed to be only accidental varieties, he has never obferved any alteration where they have been cultivated feparately for many years. Their principal difference is in the colour of their grain.

The white fort, which is moft common about London, makes the whiteft meal, and is chiefly cultivated where the inhabitants live much upon oat-cakes. The black oat is more cultivated in the northern parts of England, and is efteemed a very hearty food for horfes. Red oats are much cultivated in Derbyfhire, Staffordfhire, and Chefhire, but are feldom feen in any of the counties near London; though, as they are a very hardy fort, and yield a good increafe, they will be well worth propagating, efpecially in all ftrong lands. The ftraw of thefe oats is of a brownifh red colour, as is alfo the grain, which is very full and heavy, and efteemed better food for horfes than either of the other forts. The naked oat is leaft common in the fouthern parts of England; but in the northern counties, in Scotland, and in Wales, it is pretty much cultivated, and is particularly efteemed, becaufe its grain threfhes clean out of the hufk, and need not be carried to the mill, to be made into oat-meal or grift.

As oats are very hardy, and will thrive in almoft any foil, they have been a great improvement to many eftates in the northern parts of this kingdom, where, though fown even fo late as April, and in ftiff ground, they have ripened early, and yielded a good crop. However, February, or March, according as the feafon proves early or late, is a more common and better time for fowing this corn, of which it will always be right to fow the largeft grain fort earlieft.

Oats are often fown after a crop of wheat, rye, or barley; in which practice the common method is to turn in the ftubble, with one ploughing, about the beginning of February, and fow the feed with a broad-caft at twice, harrowing it in, once after the firft fowing, and five or fix times after the fecond, obferving to draw the harrow once or twice acrofs the furrows, to break the clods and cover the feeds; but at the other times to harrow in the fame direction as the furrows, left the ftubble fhould be raifed on the furface. But it would be much better hufbandry to plough in the ftubble in autumn, that it may rot in winter, and to give the land another ploughing, and a good harrowing, juft before the oats are fown. This will render the ground finer, and fitter to receive the grain, the increafed produce of which will amply repay the extraordinary expence of tillage. M. Duhamel, after obferving that every farmer knows, though but few practice it, that all crops of fpring-corn are greatly bettered by this method, inftances the example of M. d'Elu, one of his correfpondents, who having given three ploughings to fome of his oat-lands, had, in 1759, a year remarkably dry, and unfavourable to fpring-corn, a plentiful crop of oats, which held up well till they were perfectly ripe, and yielded excellent grain.

Another thing, which I muft alfo infift on, is, that if farmers were to follow the directions before given, in regard to the changing of crops, by which means oats, which impoverifh the ground, would always fucceed fome one of the meliorating crops, the return would be much more plentiful than in the common way, becaufe the earth would be in a much loofer ftate.

When oats, as it frequently happens, are fown upon a lay, or on ground newly broken up, after only one ploughing, which is given in January, when the earth is moift, to turn down the fward; the harrowing muft be in the fame direction as the furrows, or but very little acrofs, for fear of raifing the turf. But this again is bad hufbandry: for the ground would be brought to a much better tilth for other grain, as a preparation for which this fowing is chiefly intended, by giving the fward time to rot before the oats are fown; becaufe the roots of the grafs will prevent thofe of the corn from ftriking downward.

Black oats delight in a moifter foil than the white fort, and, being a hardier plant, may be fown a month earlier. The white, which prefer a dry land, and will do well on gravel and fand, are the beft of all corn for ground fubject to quick-grafs or weeds, becaufe it may be ploughed later for them, and they rife fooner, and top the weeds better than black oats. The weather cannot be too dry when white oats are fown; though the ground may then be moifter for them than barley will endure; becaufe this laft, having a thinner coat, is fooner chilled by imbibing the wet, which may perhaps burft many of its veffels; whereas white oats, being protected by a double hufk, better refift the entering of the moifture. Mr. Lifle, who makes thefe remarks, adds, that, according to the beft of his obfervations, white-oats require a rich feeding foil; becaufe their haulm, or ftraw, running to a great largenefs, cannot be fupported without good juices and moifture; that white chalky ground, though in never fo good heart, will be unfruitful with white oats; and that a mixed mould, between white earth and red clay, of which there is a great deal in the hilly parts of Hampfhire, is not feeding enough for them. The red and the white clays, when in good heart, carry moifture enough, and are very fit for this grain.

The common allowance of feed oats is four bufhels to an acre; but Mr. Miller rightly thinks three bufhels more than enough: and the ufual produce is about twenty-five bufhels from an acre; though he obferves, that he has fometimes known more than thirty bufhels reaped from that

that extent of ground; and we can ſay with truth, from an accurate account now in our poſſeſſion, that a gentleman, who is indeed an excellent huſbandman, has had, for a continuance, forty-eight buſhels of oats from off each acre of his land ſown with that grain. I do not mean forty-eight buſhels of naked oats; for the produce of that ſort is the leaſt of any in bulk, becauſe its grains are ſmall, and lie very cloſe together: but they make up in value, for what is wanting in meaſure. White oats always produce a greater increaſe than black oats. Mr. Liſle threſhed a ſtack of twenty-eight loads of the former, and found it yield more grain than a ſtack of thirty-eight loads of the latter; and farmers in general account an ordinary crop of white oats as good as a middling crop of black oats. This laſt ſort is alſo moſt liable to blight, eſpecially if a hot ſummer follow a dry cold ſpring, and the grain has been ſown on lay ground. Their culture is alike; and the manner of mowing and ordering them at harveſt exactly the ſame. Only it is to be obſerved, that white oats are apt to ſhed moſt as they lie, and black oats as they ſtand.

In the year 1709, M. Liſle ſowed, in the beginning of May, in ſome of his wheaten ground, where the corn had been killed by the preceding hard winter, rath-ripe barley in one part, and ſhort grained white oats, which he diſtinguiſhes by the name of white Poland oats in another. Both grains were ſown on the ſame day, in an equally fertile, moiſt and well tilled ground. He made no doubt but that the Poland oat would be firſt ripe, and was therefore ſurpriſed to ſee the rath-ripe barley ſpring up ſooneſt, by four or five days: but reflecting on the nature of each grain, he ſoon concluded the reaſon to be, that the oat, having a double hull, and being conſequently better guarded from moiſture, could not imbibe the vegetable water ſo ſoon as the barley; but that, the texture of the flour of the oat, and the infolded fibres of the incloſed plant being ſofter, it would conſequently grow faſter. From hence he infers, that, to ſecure the growing of Poland oats without rain, they muſt be committed to the earth before it becomes ſo dry as is proper for the ſowing of barley, not only becauſe the oats require more moiſture to make them grow, but alſo becauſe they lie ſo many days longer in the ground, before they come up, than the barley does.

When oats are about four inches high, intelligent huſbandmen run a wooden roller over them, after a ſhower of rain has ſoftened the clods, by the breaking of which in this manner, freſh earth is laid to the roots of the plants, their tillering is conſiderably increaſed, if they have not been ſown too thick, and the ſurface of the field is ſmoothed; ſo that the mowers, at harveſt, are able to cut cloſe to the ground, as it is very fit they ſhould, becauſe oats ſeldom grow high. Both oats and barley ſhould be carefully weeded.

Oats are ripe when the ſtraw turns yellow, the grain becomes hard, and the chaff begins to open and ſhew the ſeed. When mowed, they are generally let lie ſome time for the due and rain to plump them, and make them threſh well, and, if weedy, to kill the weeds: but if rain wet them much, they ſhould be carried off as ſoon as they can be got tolerably dry again, or they will ſhed; for oats may be inned the wetteſt of any corn, if the weeds among them be but dead. Even in very rainy harveſts, when other grain is ſpoiled, this will receive little or no damage, the ſurface of its ſtraw and ears being ſo ſmooth and compact as to turn off water, and of ſo dry a nature, that, though houſed wet, they will not heat in the mow, or become mouldy, as other grains uſually do. This is a vaſt advantage in northern climates, where the harveſt is generally late, and the autumn wet.

M. Duhamel is ſtrongly of opinion, that farmers, eſpecially thoſe who keep many cattle, would find their account in houſing their oats directly, without letting them lie out after they are cut, as is the common way, that rain and dews may moiſten, and conſequently ſwell their grain. He earneſtly adviſes huſbandmen to try the experiment upon a part of their crop; "becauſe," ſays he, "the fodder will, by this means, certainly be much better for cattle, and much leſs grain will be loſt in the field. It may be objected, that theſe oats will be difficult to threſh; to which I anſwer, that if this be the only inconvenience, the ſuperior quality of the fodder, and the ſaving of a quantity of grain, which would otherwiſe be ſhed, will probably more than pay the extraordinary wages of the threſher.

"But allowing that the oats thus houſed cannot be threſhed quite clean, and that ſome grain will neceſſarily remain in the ears, I ſay, that this will not be loſt to the farmer; for he is obliged to give his cattle unthreſhed oats, and they will eaſily find the grains remaining in the ſtraw, which will not perhaps exceed the quantity that would have been dropped in the field: and even granting, though it will not happen, that the greateſt part of the grain be left in the ear, ſtill it will not be loſt in the hands of an intelligent farmer; for what ſhould hinder him from giving it to his horſes? ſuppoſing that four ſheaves yield a buſhel of oats, he need only give his horſes thoſe ſheaves inſtead of a buſhel of corn. They will certainly be longer in feeding upon four ſheaves, than upon a buſhel of cleared oats; and at the ſame time they will eat ſome ſtraw with the corn, which will ſupply the place of other fodder, and probably prove a more healthy food." This method may be particularly beneficial to ſuch as live in very hot countries, or in very dry ſeaſons.

Mr. Liſle, refuting the opinion of thoſe who think that oats cut green will ripen while they lie in ſwarth, ſays, "If, by ripening be meant ſhrinking, drying, or withering, I muſt allow the poſition; but if the countryman will have it, that the greeniſh oat, cut a fortnight or ten days, or be it but a week, before it is ripe, will proceed in its vegetable increaſe, and ſwell as well as harden by lying in ſwarth, I muſt deny it. This year (1707) I made a full experiment of this matter; for when the ſpring corn was ſown, the ground being generally dry, half the oats and barley came not up till the latter end of May, when rain came, whereby in moſt places half the crop was edge-grown. The forward oats being then in danger of ſhedding, we were forced to cut down the greeniſh corn with the ripe, when otherwiſe we ſhould have waited ten days longer. I let them lie in ſwarth above a week, and, when I carted them, I found the hull of the greeniſh oat had got a riper colour, and the pith was well hardened, but pitifully lean and ſhrunk; ſo that though this is to be done on neceſſity, yet it ought not to be practiſed with ſuch indifference as is uſual among farmers. Note, the pith of theſe green oats was well paſt the milk, and came to a floury ſubſtance."

The ſame gentleman adds, that oats are the worſt of all grain to keep, becauſe of the great moiſture in them, and their conſequent aptneſs to heat when laid in a heap; and that when the heat has been ſuch as to ſpoil them for growing, their hulls look as red as a fox.

The meal of oats makes tolerably good bread, and is the common food of the country people in the north. In ſome places beer is made with this grain: in Ruſſia in particular the poorer ſort make with it a drink, which they call *quas*; but its principal uſe is for the food of horſes, for which purpoſe it is reckoned very wholſome, being ſweet, and of an opening nature: but it muſt not be given them before it has ſweated in the mow, or been otherwiſe dried, leſt it ſhould prove too laxative.

The very long drought of the ſummer 1762, ſhewed another very profitable uſe of oats on ſuch occaſions; and probably it will anſwer equally well in the winter. Some milk-men near London boiled oat-meal in the water which they gave their cows to drink, and found that the expence was abundantly repaid, by the additional quantity of milk which theſe cows yielded more than thoſe which had not this maſh.

The following Letter from Mr. Lamb, *on the beſt Method of cultivating Black Oats, and recommending more frequent Ploughings than are uſually afforded them, will, we are perſuaded, be acceptable to our Readers.*

Gentlemen,

"Having been for many years a practical farmer in the eaſtern part of the county of Eſſex, you will not, I hope, think me impertinent in troubling you on the culture of black oats, which I have very often to great advantage ſown.

Moſt

"Most of my neighbours prefer the white Poland oat, which may, I own, in some circumstances of soil and situation, be best. I prefer the black oats because they are hardiest, for which reason they suit best with my convenience; for, as a considerable tract of the farm I occupy is light land, I am under a sort of necessity of sowing this soil early, or, if a dry summer followed, I should have no return at harvest.

"Few people allow more than one ploughing for a crop of oats; but such as follow this practice are very wrong-headed; for they may assure themselves, that no crop pays better for ploughing than oats; and it is on this account that I generally give my land designed for oats three tilths; whence I am morally certain arises the largeness of my crops, for I have seldom under five, oftener six, and very frequently seven quarters from an acre, throughout a field

"Your readers will not be surprised at my having such good crops, when I observe, that I almost every year sow some oats on a fallow that has been well dunged; and this I aver to be good husbandry, as it abates the rankness of the soil, kills many of the weeds, and prepares the land in an excellent manner for a succeeding crop of sweet wheat; but I must observe, that I always clear my land of the stiff oat-stubble before I attempt to plough for the wheat.

"I have already said that I sow black oats early on my light land: by early, I mean as early as the first week in February, by which time I have generally an opportunity of getting the land in proper order, for a light soil is soon wet, soon dry.

"Let me mention once more to your readers, that it is on a light soil, which is apt to burn a crop, that I sow my black oats so early as the beginning of February; for should any of them attempt to sow them so early in a moist, cold, stiff soil, and a hard frost should follow, the young blade would, in all probability, be killed.

"I must also remark, that when I sow oats thus early, it is generally under furrow; yet I sometimes sow them broad-cast, and plough them in.

"The quantity of seed I, for the most part, use, is about three bushels, which I find to be enough; nay, I have sometimes from only two bushels had a good crop; but then I have been particularly careful and attentive to the goodness of the seed, without which precaution I should not, unless the season had been very favourable indeed, have succeeded.

"I have found it a very good way to sow first half my quantity of seed under furrow, and afterwards, sowing the remainder broad-cast, harrow it in; and this is often my practice when I sow the latter end of February, or the beginning of March.

"When I sow oats after wheat, which however is not very frequently, I turn up the stubble as soon as I conveniently can after harvest, and leave it rough through the winter. The first fine weather after Christmas, I lay it down smooth with the harrows, and immediately give it a cross ploughing.

"As soon as February comes in, if it is not a hard frost, I make the land as fine as I possibly can by the harrows, raising a fine loose mould to the surface, which is to be the bed for the oats to lie in; for I sow my oats directly under furrow; after which I pass a moderate-sized roller over the field, and then give it a slight scratch with a pair of light harrows.

"This husbandry generally produces me a crop I have no reason to complain of.

"My chief reason for troubling you with this letter is, to endeavour to persuade my brother farmers that they do not, in general, allow their oats a sufficient number of ploughings, one being the stated quantity.

"If they would plough twice for this crop, they would receive more than twenty shillings an acre for their trouble; but if they would consult their own interests, and allow three ploughings, it would often make fifty pounds difference to them in a field of twenty acres: this they will, perhaps, think wonderful; but it is no less true.

"The black oats require particularly to be sown early, especially if the farmer wishes to have them of a fine glossy ebon colour, and that the crop should corn well; for if they are sown late, and wet weather follows soon after sowing, they will be apt to run all to straw; and if dry weather, and the soil is gravelly, it is a chance but they are burnt up.

"I have found by experience, that black oats will yield a very large crop after turnips; and this I believe is simply owing to their being sown in a fine tilth; for the mould cannot but be reduced to very small particles if a crop of turnips has been well husbanded, especially if it is in a light soil.

I am, &c.

East of Chelmsford, Essex. J. LAMBE."

Wild OATS, a species of oats difficult to be extirpated where they have once taken possession; for ripening before harvest, and scattering their seed round them, they will remain in the ground till it is ploughed up again, though it be for a whole year, some say four or five years, and will then come up with the corn. The surest way to destroy them, is to lay the ground down to clover, and to mow the oats and clover together before the oats are ripe.

OILS, the beards, or prickles of barley, &c.

OLITORY, a kitchen-garden.

OLIVE-TREE, the name of a tree much cultivated for its fruit in the warmer climates, and which will grow in almost any soil, provided the situation be very warm, and the exposure to the south or east, especially on the side of a hill, or other rising ground; for it never bears well in a flat, or valley. It grows to the largest size when planted in rich moist ground: but its fruit is best, either for eating, or for making oil, when produced on a poorer soil. That which grows on chalky land mixed with coarse sand, and lying upon a bed of gravel, is thought to yield the finest and best keeping oil: but a watery, oozy, or quite chalky soil, is not fit for the olive.

This tree seldom rises higher than from twenty to thirty feet; nor is it often seen with a single stem, but generally with two or three, which rise from the same root, and put out from their sides, for almost their whole length, branches which are covered with gray bark, and garnished with stiff leaves about two inches and an half long, and an inch broad in the middle, gradually diminishing to both ends. They stand in opposite pairs, and are of a lively green on their upper side, and hoary on the under. The flowers, which are produced in small bunches from the wings of the leaves, are small, white, and have short tubes, spreading open at the top; and these are succeeded by oval fruit, which ripens in the autumn.

It would be at least very tedious to raise olive-trees from the stones of their fruit: but they may be easily enough propagated by layers, cuttings, or offsets from their roots.

The layers, which are formed by laying down the tender branches, in the same manner as is practised for other trees, must be allowed two years to take root, before they are cut off from the mother-tree, in order to their being planted in the nursery; for a nursery is as necessary for the raising of these, as it is for any other sort of fruit-trees. This nursery should be in a free air, in land that is moderately strong, but rather light than heavy, and somewhat moist, though by no means wet or watery. It should be ploughed well, and repeatedly, or rather thoroughly dug, to the depth of at least three feet, so long before the time of planting, as that it may be well mellowed by the influences of the air, &c.

The cuttings, or rather truncheons, for they should be full two inches in diameter, and not above a foot and an half long, should be taken from the straitest, roundest, and most fruitful branches of young trees, the bark of which is smooth, and perfectly sound. They should be sawed off with care not to hurt the bark or any other part of them, and with eyes towards each end, to produce shoots at the one, and roots at the other. Both the cut extremities should then be smoothed with a sharp knife; and after that the wounds have been covered with the grafting clay or cement, or says Columella, with dung mixed with ashes, these truncheons should be set in the nursery, so deep as that the upper end may be covered with four fingers depth of earth. Care must be here taken to place that end uppermost, which was uppermost on the tree; and in order to be sure of this

this, they ſhould be marked with chalk, or ſome other ſoft ſubſtance, as ſoon as they are cut: for if they were put under ground inverted, it would be long before they would ſtrike out roots, and even though they ſhould afterwards produce ſtrong trees, they would be for ever barren. A mark ſhould alſo be ſtuck upon each ſide of the cutting thus planted, in order that the digger of the nurſery may not injure it with his ſpade or hoe. The beſt way therefore is to ſet them in ſtrait rows, and at regular diſtances from each other.

When the offsets from the roots, which are generally moſt numerous when the head of the tree has been hurt by froſts in the winter, are grown pretty ſtrong, they are ſeparated from the tree with a ſharp axe, ſo as to preſerve a few roots to them, and they are planted about two feet deep in the ground. This is the moſt uſual method of propagating the olive-tree in Languedoc and Provence.

November is the moſt proper ſeaſon for either of the above ways of planting in very warm countries; but February and March are preferable for milder climates.

The holes for planting theſe layers, cuttings, or offsets, but eſpecially for the cuttings, or truncheons, ſhould be four feet large every way, and ſhould remain open for at leaſt two months before the plants are ſet in them, in order that the earth may be the better mellowed. The mould which is to be returned into them ſhould alſo be mixed with well rotted dung and wood-aſhes; and when the plants are ſet, it ſhould be trodden down gently about them.

The young trees muſt remain in this nurſery five years, during the firſt of which the ground ſhould be well hoed with a hand-hoe, and in the courſe of the others it ſhould be dug with a ſpade, or carefully horſe-hoed, at leaſt every ſpring and autumn, and it ſhould be kept conſtantly clear from weeds. The ſoil ſhould alſo be well manured every autumn with thoroughly rotted dung, and the plants ſhould be watered now and then in very dry ſeaſons. They ſhould not be pruned at all during the two firſt years: in the third, two branches only ſhould be left upon each of them; and in the fourth, the weakeſt of thoſe two branches ſhould be cut off. When the trees thus reared are five years old, they will be fit to tranſplant into the places where they are to remain. This is beſt done in November, if the ground intended for their future growth is dry, and the climate hot: but the ſpring, a little before their time of budding, is beſt for ſuch lands as are rich and moiſt. The trenches, or holes, for this new planting ſhould be laid open for a year before they are uſed; or if ſo much time cannot be allowed, let ſtraw be burnt in them, that the heat of the fire may bring the mould to that looſe and crumbling ſtate, which it would otherwiſe have derived, ſtill more effectually, from the ſun, air, and froſts. Care ſhould alſo be taken, that there be no wet at the bottom of them when they are planted; and the earth with which they are filled up after the trees are ſet (being that which was before dug out of them, and ſpread abroad to mellow) ſhould be mixed with well rotted dung, and trod down gently about the ſtems, as above directed for the nurſery. The rows of theſe trees ſhould be from about thirty to thirty-five feet aſunder in land which is rich enough to bear corn; but about twenty or twenty-five feet will be enough for ground of an inferior quality, where their growth will, of courſe, be leſs luxuriant. The diſtances between the trees in the rows ſhould be in proportion; and, both here and in the nurſery, they ſhould be carefully fenced from cattle, eſpecially whilſt they are young. The trees ſhould be taken up with as much earth as can be about their roots: the rows ſhould be directed towards the weſt, that the ſummer breezes may have the freer paſſage through them; and Columella is again of opinion here, that the trees thus tranſplanted ſhould be ſet to the ſame aſpect as they had in the nurſery.

The olive grounds in the ſouth of France are carefully dug, or ſtirred pretty deep with a hoe, twice a year, viz. at Midſummer and at Michaelmas. Channels are likewiſe cut to convey the rain, and the fine mould which is waſhed down with it, from the higher parts of the ground to the ſtems of the trees on the lower; and in the autumn, about ſix pounds of goats-dung are laid around the foot of each olive-tree, with ſometimes a ſmall quantity of the lees of oil of olives, to fatten the land, and kill the worms which breed in it. The roots of the olive-tree are laid bare every year from October till February; all young ſhoots which have ſprung out of the lower part of the ſtock are extirpated every year, unleſs it be an old tree which is to be renewed thereby, in which caſe one or two of the fineſt ſhoots are left; and all the dead wood is pared off very cloſe.

The olive-tree is not pruned till it is eight years old, nor, after that, oftener than once in eight years. This is moſt uſually performed at the end of the winter, a little before the buds begin to ſwell. It ſhould be done in fine weather; and the people of Provence and Languedoc, who may poſſibly have experience on their ſide, and therefore we ſhall not pretend to contradict them, hold, that the moon ſhould always be in the decreaſe when theſe trees are pruned. They heal the wounds made in pruning, by rubbing them with lees of oil drawn without ſalt, or covering them over with the ſubſtance which remains of the olives after their oil has been preſſed out.

Skilful huſbandmen manure their olive grounds every third year, generally with well rotted dung, whether they be, or be not, ſown with corn in the intervals between the trees; which laſt practice Columella recommends, becauſe, as the olive-tree does not produce an equal plenty of fruit in any two ſucceſſive years, the other crop will help to make amends for the deficiency, and the ſtirring of the ground, by ploughing it, will always be of ſervice to the trees.

An olive-tree which thrives well, and does not produce fruit, may be made to bear by cutting off one of its principal roots; or by laying to its roots lees of unſalted oil, mixed with ſtale urine of men or ſwine: but the ſureſt way is to engraft it with a good cion of its own kind, taken from a fruitful branch of a well bearing tree. This is generally done in May, and the method is that of ſcutcheon-grafting; but no part of the ſtock is cut off till a year after. Then, indeed, its head is cut off cloſe to the graft.

In Provence, when an olive-tree is decayed, and therefore condemned to be grubbed up, the following method is uſed in order to force it to yield a good final crop. The breadth of an inch of bark is peeled off all around its youngeſt branches, and the place thus bared is covered with an equal ſlip of other bark taken from the branch of a young tree of the ſame ſpecies. The wound is then dreſſed in the ſame manner as is practiſed for grafing, and the branches of the old tree thus ſpliced in the rind yield an uncommon quantity of fruit. Nearly the ſame thing is done in Languedoc, by grafting old olive-trees in the month of May, and then cutting the bark off circularly to the breadth of about three fingers, juſt above the graft, ſo as to lay bare the wood of the ſtem or branch which has been engrafted; the conſequence of which is found to be, that the tree produces a double quantity of bloſſoms and of fruit. The trees thus forced die indeed the ſame year: but as this operation is not performed till they are no longer worth cultivating, it is thought beſt to kill them in this manner, becauſe an extraordinary crop of fruit is obtained thereby.

In Spain, the olive-trees are not ſuffered to grow ſo high as they do in France: on the contrary, they are kept low, like ſhrubs, and are found then to yield the moſt fruit, which is alſo leaſt apt to be blown off or injured by high winds, and likewiſe the eaſieſt to be gathered. Theſe trees are therefore cut low when they are pruned: for their nature is to produce either a great deal of wood, or a great deal of fruit. The Spaniards give the preference to their large olives, becauſe they are moſt fleſhy, and yield the greateſt quantity of oil: but neither the fruit nor the oil of that country is at all comparable to the product of France or Italy.

The olive-tree is long lived, and its wood, which has an agreeable ſmell, and is prettily veined, is eſteemed by the turners.

The antients looked upon the olive as a maritime-tree, and ſuppoſed that it would not thrive far from the ſea: but, though it does bear the ſpray of the ſea better than moſt other ſorts of trees, experience has ſhewn that it it will fucceed perfectly well in any country where the air has a proper degree of heat.

The fruit of this tree is gathered by hand, either in June or July, while the olives are green, if they are intended for pickling; or in November and December, or even January, when they are thoroughly ripe, which is known by their beginning to turn to a blackifh red, if they are defigned for oil.

OLLET, fuel of any kind.

OMY, mellow; fpoken of land.

ONION, the name of a well-known plant propagated in kitchen-gardens.

Onions intended for the general winter crop fhould be fown in the latter end of February, or beginning of March, on rich light ground, well dug and levelled, and cleared from the roots of all weeds. The weather fhould be dry, and the furface of the ground not moift, at the time of fowing. The common allowance of feed is after the rate of fix pounds to an acre of land: but the generality of gardeners fow more, in order to allow for drawing out a crop, which they call cullings. However, they ought not to be fown too thick.

The way of fowing thefe feeds alone in the garden is, to ftrew them as equally as poffible over the ground intended for them, then to tread or beat it down flat, in order to fix them in their places, and as foon as they begin to fhoot, to fift a little fine earth over them, to the thicknefs of fomewhat lefs than a finger's breadth: for they muft not be buried deep.

In about fix weeks from the time of fowing, the onions will be forward enough to be hoed. This fhould be done in dry weather, with a hoe about two inches and an half wide; carefully cutting up all weeds, and thinning the plants themfelves, till they ftand at leaft two or three inches afunder. In about a month after, they muft be hoed again, and thinned till they are four or five inches from each other; and in about a month or fix weeks more, they muft be hoed for the third and laft time, and thinned to the diftance of at leaft fix inches. If this hoeing (which may be performed with a wider hoe, for the fake of greater riddance) be well executed, and the weather proves dry, the ground will remain clean till the onions are fit to pull up, which will generally be towards the middle of Auguft. But if the feafon be wet, a careful perfon fhould go over the ground, about a fortnight or three weeks after this laft hoeing, and pluck up by hand all weeds that may chance to have taken frefh root, or to have fprung up fince the former clearing: for the onions fhould not be difturbed with a hoe after they have begun to bulb.

Onions have attained their full growth when their blades fall to the ground, and fhrink: but before their necks are withered off, the bulbs fhould be taken up, and, after cutting off the extremity of their leaves, be fpread upon a dry fpot of ground, and there turned every other day at leaft, to accelerate their drying, and prevent their taking frefh root; which laft they will otherwife quickly do, efpecially in moift weather. With this management, they will be fit to houfe in about a fortnight. But at the time of hoeing them, which fhould be done in perfectly dry weather, particular care fhould be taken to rub off all remaining earth, to feparate the faulty roots, which would foon decay and fpoil the reft, and not to lay them up in too thick heaps, leaft this fhould make them fweat, and confequently rot. A loft, or garret, is therefore preferable to a lower room, or ground-floor, for keeping them in; and the lefs they are expofed to the air, the better they will be preferved. It will be right here to look them over at leaft once a month, and to pick out all fuch as are found to be decaying: though, with all the care that can poffibly be taken, many of them will fprout in the loft, efpecially in mild winters, which are generally moift, unlefs their roots have been flightly finged with a hot iron. This, indeed, will effectually prevent their growing: but great caution muft be ufed not to fcorch the pulp of the onions; for that would foon deftroy them.

To fave the feeds of onions, fome of the firmeft, largeft, and beft fhaped bulbs fhould be replanted, in the beginning of March, in well dug beds of fine good mould, about three feet wide, and two feet afunder. Each of thefe beds will confequently be wide enough to contain four rows of plants, at the diftance of near a foot from each other. To make thefe rows, a channel, for each, fhould be opened all along the bed, to the depth of about fix inches, and the onions intended for feed fhould be placed therein, with their roots downward, at about nine inches afunder. They fhould then be covered, by raking the ground fmooth, and in about a month's time their leaves will appear. Many of thefe roots will produce three or four ftalks. Care muft be taken to keep them clear from weeds; and towards the beginning of June, when the heads of the flowers begin to fhew themfelves upon the tops of the ftalks, ftakes, about four feet long, fhould be fixed in the ground, at fuch diftances, that ftrings may be faftened from one to the other, fo as to fupport thofe heads, which would otherwife foon be broken down by wind and rain, or even by their own weight. Thefe ftrings fhould therefore run clofe under the heads that are to be fupported by them.

About the end of Auguft, the heads of the onions will turn brown, and the cells which contain the feeds will begin to open. This is a fure fign of their being ripe, and no time fhould then be loft to cut them, leaft they fhould fall to the ground. The heads thus cut fhould be immediately fpread upon coarfe cloths, and expofed to the fun: but they fhould be fheltered at night, and alfo in wet weather. When they are quite dry, the feeds muft be beaten out, which is very eafily done, and after clearing them from their hufks, &c. and expofing them again to the fun, for one day, to complete their drying, they may be put up in bags, and kept for ufe.

The Spanifh onion is moft efteemed for its mildnefs as well as fize; but it foon degenerates in this country. The next place is given to the Strafburgh, and the third to the white, fometimes called the Egyptian, which is the fpecies that furnifhes the general winter crop, of which only we have hither to fpoken. But the gardeners about London generally raife two other crops from this fame fort. One of thefe crops, known by the name of Michaelmas onions, is fown in Auguft, and fupplies the markets after the winter onions are over: the other is fown in the fpring, and is drawn up for fallads, after the Michaelmas onions are grown too large for that purpofe.

Welch ONIONS, a fort of onions propagated by gardeners for the ufe of the table in fpring; they never make any bulb, and are therefore only to be eaten green with fallads.

They are propagated by fowing their feeds towards the end of July, in beds of a dry but rich foil; and in three weeks after fowing, they will appear above ground; when they muft be kept very free from weeds. About October all their leaves die away, which has occafioned fome to think all the plantation loft, and to dig up the ground for fome other ufe; but if they are fuffered to ftand, they will fhoot up again very ftrong in January, and from that time will grow very vigoroufly, refift all weathers, and be fit to draw in March, when they will be extremely green and fine. They are much ftronger than any other fort of onions, and have much of the tafte of garlic.

OPE-LAND, ground that is loofe or open, from its being ploughed up every year.

ORANGE, the name of a delicious fruit of the apple kind, too well known to need defcription.

This fine tree not being natural to our climate, we muft quicken the nature of our foil with a compofition that may caufe it to correfpond as much as poffible with the temperament of warmer countries. It delights greatly in a foil that is compofed of an equal quantity of fheep's dung that has refted two years; old compoft, or the foil of a fewer; and fat land taken either from a marfh or hemp-clofe.

When the proper feafon is arrived for lodging your young ftems in boxes, thefe latter fhould always be proportioned to the heads of the plants. The ftems, even when they are become vigorous, will accommodate themfelves to a box of about fifteen inches diameter; but they muft be placed more at large in others, when the tree ceafes to augment its foliage, and informs you, by its languid air, that its foil and fuftenance are infufficient. At the end of feven or eight years, they may be tranfplanted, with all the earth, into their laft boxes, whofe diameters

may

may be about twenty-four inches. All thefe boxes fhould be made of entire heart of oak, and cafed over with a double coat of green paint liquified with oil, as alfo on the infide, in order to preferve the wood from rotting by frequent waterings, as it is on the outfide, to fecure it from rain and fun.

The large boxes fhould have a door with double hinges, and two iron-bars to admit the proper renovations of foil, and to enable you to clear the box of that liquid fediment that is collected and thickened at the bottom; and likewife to pare off the extreme parts of the mould, that it may afterwards be taken out with eafe, when it is neceffary to transfer it into a new box.

In order to place fome fhrubs, and more efpecially orange trees, in boxes, after a proper manner, the firft proceeding is to cover the bottom of the boxes with large pieces of brick and potfherds, which afford the water an eafy flow through the cavities that are opened at the bottom. Were it not from this precaution, the humidity collected by the fediment would rot the box, and deftroy the tree by an immoderate chilnefs. When this provifion has been made for the fecurity of the tender plant, the bottom and fides of the box muft be lined with good foil, prepared in the manner already mentioned: in this foil the tree fhould be inverted in an upright pofition, and the ball of earth at its roots muft be leffened, not with an intention to ftrengthen the tree, but rather to prevent its requiring a large quantity of earth, and to confine it by a moderate vigour to a juft proportion with the box. A new mafs of earth muft then be heaped up on every fide, and preffed with a due compactnefs, in order to fecure the ftem from violent winds, and caufe the earth to fettle round the root with as much exactnefs as poffible.

When the tree is to be placed in the box, care fhould be taken to raife the upper part of the clod of the earth at its roots higher than the rim of the box, becaufe the weight of the tree and the action of the roots will afterwards lower the clod by degrees to a level with the edge of the box. If this precaution be neglected, the tree in procefs of time will fink too low. And, that the upper part of the clod may not be expofed to the air, it fhould be covered over with earth, and the whole fuftained by fmooth ftaves difpofed round the edges of the box.

When fruit-trees are to be pruned, care fhould be taken to preferve the fmall branches in a thriving ftate, in order to promote their fertility; but they are retrenched in an orange-tree, that a vacancy may be opened within. The fame method is taken with the branches that fhoot downwards in a perpendicular direction; and alfo with thofe that are divefted of their leaves, which only happens, when the tree is weak or diftempered: but we carefully preferve all the vigorous branches, whofe advantageous fituation contributes to the regularity of the head.

Oranges are brought from feveral parts. The beft and moft in efteem for a good tafte are thofe which grow in hot countries; not only becaufe the foil of the places, having ftore of exalted fulphur and volatile falts in it, communicates a great quantity of the fame to thefe fruits, and gives them an agreeable fmell, but becaufe the heat of the fun there digefts, and more completely ripens their juice, and gives them a more delicious tafte. *Miller's Gard. Dict.*

ORCHARD, a plantation of fruit-trees.

It is a rule among gardeners, that thofe orchards thrive beft which lie open to the fouth, fouth-weft, and fouth-eaft, being fcreened from the north, and have the foil dry and deep.

In planting of an orchard, great care fhould be had to the nature of the foil, that fuch trees as are adapted to grow upon the ground intended to be planted, may be chofen, otherwife there can be little hopes of their fucceeding; and it is for want of rightly obferving this method, that we fee, in many countries, orchards planted which never arrive to any tolerable degree of perfection, their trees ftarving, and their bodies either covered with mofs, or the bark cracks and divides; both which are evident figns of the weaknefs of the trees; whereas, if inftead of apples, the orchard had been planted with pears, cherries, or any other fort of fruit to which the foil had been adapted, the trees might have grown very well, and produced great quantities of fruit.

As to the pofition of the orchard, if you are at full liberty to chufe, a rifing ground, open to the fouth-eaft, is to be preferred; but we would by no means advife to plant upon the fide of an hill, where the declivity is very great; for in fuch places the great rains commonly wafh down the better part of the ground, whereby the trees would be deprived of proper nourifhment; but where the rife is gentle, it is of great advantage to the trees, by admitting the fun and air between them, better than it can upon an entire level; which is an exceeding benefit to the fruit, by diffipating fogs, and drying up the damps, which, when detained amongft the trees, mix with the air, and render it rancid: if it be defended from the weft, north, and eaft-winds, it will alfo render this fituation ftill more advantageous; for it is chiefly from thefe quarters that fruit-trees receive the greateft injury: therefore, if the place be not naturally defended from thefe by rifing hills, which is always to be preferred, then you fhould plant large growing timber-trees at fome diftance from the orchard, to anfwer this purpofe.

You fhould alfo have a great regard to the diftance of planting the trees, which is what few people have rightly confidered; for if you plant them too clofe, they will be liable to blights; and the air, being hereby pent in amongft them, will caufe the fruit to be ill-tafted, having a great quantity of damp vapours from the perfpiration of the trees, and the exhalations from the earth mixed with it, which will be imbibed by the fruit, and render their juices crude and unwholefome.

Wherefore we cannot but recommend the method which has been lately practifed by fome particular gentlemen with very great fuccefs; and that is, to plant the trees fourfcore feet afunder, but not in regular rows. The ground between the trees they plough and fow with wheat and other crops, in the fame manner as if it were clear from trees; and they obferve their crops to be full as good as thofe quite expofed, except juft under each tree, when they are grown large, and afford a great fhade; and, by thus ploughing and tilling the ground, the trees are rendered more vigorous and healthy, fcarcely ever having any mofs, or other marks of poverty, and will abide much longer, and produce better fruit.

If the ground in which you intend to plant an orchard has been pafture for fome years, then you fhould plough in the green fward the fpring before you plant the trees: and, if you will permit it to lie a fummer fallow, it will greatly mend it, provided you ftir it two or three times, to rot the fward of grafs, and prevent weeds growing thereon.

At Michaelmas you fhould plough it pretty deep, in order to make it loofe for the roots of the trees, which fhould be planted thereon in October, provided the foil be dry; but, if it be moift, the beginning of March will be a better feafon.

When you have finifhed planting the trees, you fhould provide fome ftakes to fupport them, otherwife the wind will blow them out of the ground; which will do them much injury, efpecially if they have been planted fome time; for, the ground at that feafon being warm, and for the moft part moift, the trees will very foon pufh out a great number of young fibres; which, if broken off by their being difplaced, will greatly retard the growth of them.

In the fpring following, if the feafon fhould prove dry, you fhould cut a quantity of green turf, which muft be laid upon the furface of the ground about their roots, turning the grafs downward; which will prevent the fun and wind from drying the ground, whereby a great expence of watering will be faved: and, after the firft year, they will be out of danger, provided they have taken well.

Whenever you plough the ground between thefe trees, you muft be careful not to go too deep among their roots, left you fhould cut them off, which would greatly damage the trees: but, if you do it cautioufly, the ftirring of the furface of the ground will be of great benefit to them; though you fhould obferve never to fow too near the trees, nor fuffer any great rooting weeds to grow about them, which would exhauft the goodnefs of the foil, and ftarve them.

If, after the turf which was laid round the trees be rooted, you dig it in gently about the roots, it will greatly encourage them. There are some persons who plant many sorts of fruit together in the same orchard, mixing the trees alternately; but this is a method which should always be avoided; for hereby there will be a very great difference in the growth of the trees, which will not only render them unsightly, but also the fruit upon the lower trees ill-tasted, by the tall ones overshadowing them; so that, if you are determined to plant several sorts of fruit on the same spot, you should observe to place the largest growing trees backwards, and so proceed to those of less growth, continuing the same method quite through the whole plantation; whereby it will appear at a distance in a regular slope, and the sun and air will more equally pass through the whole orchard, that every tree may have an equal benefit therefrom.

The soil of your orchard should also be mended once in two or three years with dung, or other manure, which will also be absolutely necessary for the crops sown between; so that where persons are not inclinable to help their orchard, where the expence of manure is pretty great; yet, as there is a crop expected from the ground besides the fruit, they will the more readily be at the charge upon that account.

In making choice of trees for an orchard, you should always observe to procure them from a soil nearly a-kin to that where they are to be planted, or rather poorer; for, if you have them from a very rich soil, and that wherein you plant them is but indifferent, they will not thrive well, especially for four or five years after planting; so that it is a very wrong practice to make the nursery, where young trees are raised, very rich, when the trees are designed for a middling or poor soil. The trees should also be young and thriving; for, whatever some persons may advise to the contrary, yet it has always been observed, that though large trees may grow, and produce fruit, after being removed, they never make so good trees, nor are so long-lived, as those which are planted while young.

These trees, after they are planted out, will require no other pruning but only to cut out dead branches, or such as cross each other, so as to render their heads confused and unsightly: the too often pruning them, or shortening their branches, is very injurious; especially to cherries and stone-fruit, which will gum prodigiously, and decay in such places where they are cut: and the apples and pears, which are not of so nice a nature, will produce a greater quantity of lateral branches, which will fill the heads of the trees with weak shoots, whenever their branches are thus shortened; and many times the fruit is hereby cut off, which, on many sorts of fruit-trees, is first produced at the extremity of their shoots.

It may, perhaps, seem strange to some persons, that we should recommend the allowing so much distance to the trees in an orchard, because a small piece of ground will admit of very few trees, when planted in this method: but they will please to observe, that, when the trees are grown up, they will produce a great deal more fruit than twice the number when planted close, and will be vastly better tasted; the trees, when placed at a large distance, being never so much in danger of blighting as in close plantations, as hath been observed in Herefordshire, the great county for orchards, where they find that when orchards are so planted or situated, that the air is pent up amongst the trees, the vapours which arise from the damp of the ground, and the perspiration of the trees, collect the heat of the sun, and reflect it in steams so as to cause what they call a fire-blast, which is the most hurtful to their fruit; and this is most frequent where the orchards are open to the south sun.

But, as orchards should never be planted, unless where large quantities of fruit are desired, so it will be the same thing to allow twice or three times the quantity of ground; since there may be a crop of grain of any sort upon the same place, as was before said, so that there is no loss of ground: and, for a family only, it is hardly worth while to plant an orchard; since a kitchen-garden well planted with espaliers will afford more fruit than can be eaten while good, especially if the kitchen garden be proportioned to the largeness of the family: and, if cyder be required, there may be a large avenue of apple-trees extended cross a neighbouring field, which will render it pleasant, and produce a great quantity of fruit; or there may be some single rows of trees planted to surround the fields, &c. which will fully answer the same purpose, and be less liable to the fire blasts before-mentioned. *Miller's Gard. Dict.*

ORCHARD-GRASS, the name of a small, coarse, but very sweet grass. It is of very quick growth, and may possibly hereafter be cultivated to advantage.

ORE-WEED, a general name for weeds growing at the bottom of the sea, and also on the muddy and rocky parts of the shore.

Sea-weeds are so beneficial a manure, that farmers ought not to grudge the expence of carrying them a few miles. In Devonshire, Cornwall, and other maritime parts of England, these weeds are laid in heaps till they are rotten, and then spread upon the land, about a load to three rods: but this lasts only one year, unless sand, or a stiff earth, according to the quality of the soil intended to be improved, be laid on or mixed with them; and then they become a lasting manure. In some places, these weeds are gathered in heaps, and burnt as soon as they are dry; after which about a bushel of their ashes is laid on upon three rods of ground. But these, like all other ashes, should be mixed with sand, or stiff earth, if you would have the land last good: otherwise, they are only an improvement for a year. These ashes are particularly good for grass grounds over-run with moss. Loose sandy soils are likewise peculiarly benefited by this weed: but, being a sub-marine plant, the wind and sun soon exhale its moisture; so that the more speedily it is taken from the shore, where storms often throw it up in great quantities, the better it is. When spread on the ground, and afterwards covered over, it soon dissolves into a salt oily slime, proper to fertilize and bind light soils. This is the most approved way of applying it: though some lay it naked and fresh from the sea, upon their barley lands, towards the end of March and beginning of April, and have a good crop of corn: but such quantities of rank weeds are apt to shoot up afterwards, that no wholesome plant is to be expected that year.

The value of the lands all along the coast of Scotland has been more than doubled by the use of this excellent manure. It is chiefly used there for barley; and the farmers watch every opportunity when it is thrown in by the sea, and lay it on at all seasons, in autumn, winter, and spring. But if they could choose their time, it would probably do best about the month of March; for being then ploughed into the ground, and afterwards ploughed up again to the seed, it would be incorporated and blended with the soil; whereas, if it be laid on in autumn, before the fallowing or first ploughing, it is too much wasted before the spring; and if it be laid on to the seed-furrow, it is apt to burn the ground in a dry season, though it will do very well in this method in a wet summer. Its effects are but just felt the second year; though it is laid on thicker upon strong clay land, which receives no other manure for three crops, viz. barley, oats, pease, and beans; a method which might, perhaps, be altered for the better by omitting the oats, and sowing alternately barley, and pease and beans, and laying on the sea-ware, as these weeds are commonly called, for every second crop of pease and beans.

We see by the abridgement of Mr. Scott's account of the manner of using sea-ware in Scotland (published by Mr. Maxwell in his Miscellaneous Papers) that much of this valuable manure must necessarily be lost through want of proper management: for they have no reservoirs to keep it in, when thrown ashore at a season in which they cannot use it, or where there is no ground in tilth, as is generally the case in winter, and during the busy part of their hay and corn harvest. It should be collected on these occasions, and lodged in a place free from any running water; and, as it is equally beneficial to strong or light lands, it might be there covered with sand or clay, according to the nature of the soil for which it is intended. This will prevent its being parched by the sun, or its dissolving into a putrid mass, which, if not secured in this manner, would either be washed away by rains, or fly off into the air: whereas, when thus covered, it would greatly enrich the

the clay or sand, and render them good manures for their opposite soils. If it be thrown ashore at a time when it can be ploughed in directly, that is certainly the best manner of using it.

Mr. Scott observes, that there is a kind of land all along the coast, which is gravelly, and covered over so thick with sea-stones, that, to look at it, one would not think corn could spring through them; and another sort of land, which is a deadish sand. To both these grounds sea-ware is the only manure; for dung of all kinds has been often tried, but with no success; and yet sea-ware makes them bring excellent crops of barley. This kind of ground is seldom ploughed more than twice, and the sea-weed is generally laid on before the first ploughing. Barley is sowed during two years, and pease the third; a fresh manure of sea-weed being laid on each year that barley is sown. As little wheat is cultivated in the country where Mr. Scott lived, the farmers there might probably improve their practice of raising barley and pease, by sowing them alternately, and laying the sea-ware to the pease. In the summer, it is carried to a distance from the sea, and laid upon ley-ground (arable land under grass) which, though in very ill heart, will bear a good crop of oats with only once ploughing, or of barley, if ploughed again in the spring.

Another kind of sea-ware, of a much stronger nature than that which is thrown up by the waves, is cut from the rocks at low water, and will last three years. It costs more labour, but brings greater recompence. Mr. Scott thinks the best time of laying this on the ground would be in autumn, before the land is ploughed rough for a spring crop.

The farmers on the coast of Scotland (and I believe the same may be said, in general, of those in most of the maritime parts of England) prefer this manure to any other, especially for their light grounds; and it has the advantage of being much more easily transported, because one load of it will go as far as two of dung.

It does very well in kitchen-gardens, where Mr. Scott says he has seen pot-herbs and roots of an extraordinary size produced by its help; to which he adds, that he has known fruit-trees, perfectly barren before, rendered extremely fruitful by laying this manure about their roots.

Mr. Duhamel likewise informs us, that these sea-weeds are used with great success in the maritime provinces of France.

OST, *Oost*, or *Oust*. *See* OUST.

OVER-REACH, a wound in the fore-heel of a horse, made by the point of the hind-shoe.

When this wound is only slight or superficial, it is, in general, very easily cured by washing it clean, and applying the wound ointment: but it should be observed from the nature and manner of the injury, where the blow has been smart, that it differs widely from a common cut; the part here being both torn and bruised, and consequently it requires to be properly digested, in order to lay a good foundation for healing.

For this purpose, after washing out any dirt or gravel with sope-suds, &c. let the wound be digested, by dressing it with dossils of lint dipped in an ounce of Venice turpentine, divided with the yolk of an egg, to which half an ounce of tincture of myrrh may be added; over this dressing it would be advisable to apply the turnip poultice, or that with strong beer grounds and oatmeal, three or four times, or oftener, till the digestion is procured, and then both these dressings may be changed for the precipitate medicines, or the lime-water mixture; observing always to apply the dossils carefully to the bottom, to fill up the sore with the same even to the surface, and to bind all on with a compress and roller: and if any cavities appear that cannot conveniently be dressed to the bottom, they should always be laid open, or no proper foundation for healing can be obtained. The hoof also should be kept supple, or pared away, when the growth of it interrupts this end, as is sometimes the case. *Bartlet's Farriery, page* 244.

OUGHTS, leavings.

OUST, a kiln, generally applied to that used in drying malt.

It is built with fire-places in the nature of malt-kilns; and at a proper distance over the fire is an hair-cloth strained upon laths; and thereon the hops are laid, and raked even to the depth of about six or seven inches, for the better conveniency of drying them equally; and when they are properly cured on the under side, they are carefully turned; and by that means the upper side becoming the under, the whole shares the fire alike. The person that performs this part is called the dryer, whose business it is to manage the fires.

The fuel commonly made use of is charcoal, for its freeness from smoke, and affording a steady heat. Great nicety is required in this part; a small fire being to be made, at first, that they may heat gradually, and so raised as they dry, that it may be done without scorching; and the fire is to be lowered by degrees, against they are ready to be taken off: the time required is about eight hours.

But as charcoal is very dear, being three or four pounds per load, many people have adopted the method of drying with sea-coal, upon what they call cockle-ousts, which are square iron-boxes placed upon brick-work, and a flue and chimney in the back part of the building for the smoke to go off. The computation is, that a chaldron of sea-coal, at about twenty-four shillings, will dry a load of hops, and that a load of charcoal will do no more. It is indeed expensive to erect such ousts, as there must be no timber near them; and an iron-beam and iron-laths are to be used, and they covered with plates of tin or iron properly fastened together.

A gentleman has lately claimed the merit of having invented a new method of drying hops with sea-coal, or any kind of fuel whatever, by means of a moveable iron furnace: it is in form of an horizontal cylinder, stopped at both ends: it lies on an iron carriage, which rolls on four iron-wheels: in the fore-end of the cylinder is the furnace door, and a hollow iron flue runs in an horizontal direction along the upper surface of the cylinder from the back till it reaches the fore-end of it, when it takes a vertical direction, and is carried as high as is necessary to convey the smoke out of the oust. We cannot pretend to say what are the particular advantages resulting from the use of this rolling furnace, never having seen it at work.

OUST-HOUSES, out-houses, or such as belong to, and are adjoining to the dwelling-houses.

OX, the name of an animal well known, being a bull castrated.

Oxen, like other domestic animals, vary in colour, though the dun seems the most common; and the redder it is, the more it is esteemed. A black coat is also valued; and bay oxen are said to be vigorous and long lived; whereas the brown soon decay. The grey, the dappled, and the white, are proper only for the slaughter; no care can render them fit for labour; but whatever be the colour of an ox's coat, it should be glossy, thick, and smooth to the touch; for if it be harsh, rough, or thin, there is reason to suppose that the animal is out of order, or at least not of a strong constitution. A good ox for the plough must be neither too fat nor too lean; the head short and thick; the ears large and shaggy; the horns strong, glossy, and of a middling size; the forehead wide, the eyes full and black; his muzzle large and flat; the nostrils wide and open; the teeth white and even; the lips black; a fleshy neck, large and heavy shoulders; the breast broad; the dew-lap hanging down to the knees; the reins very broad; a spacious descending belly; the flanks firm; the haunches large; and the rump thick; large and nervous thighs and legs; the back straight and full; the tail reaching to the ground, and well covered with thick and fine hair; the feet firm; the hide thick and pliable; the muscles raised; the hoof short and broad: he must also answer to the goad, be obedient to the voice, and well trained; but it is only gradually, and by beginning early, that the ox can be brought willingly to bear the yoke, and be easily governed. At the age of two years and a half, or three at the latest, you must begin to tame him, and bring him under subjection; if delayed longer, he becomes froward, and often ungovernable. The only method of succeeding is, by patience, mildness, and even caresses, for compulsion and ill-treatment will only disgust him irreclaimably; stroaking him gently along the back, clapping him, giving him occasionally boiled barley, ground beans, and such other aliments as please him best, all of

them

them mingled with salt, of which he is very fond, will prove of the greatest use. At the same time his horns should be often tied, and some days after the yoke is to be put on his neck, and fastened to a plough, with another ox of the same size ready trained; these are to be tied together at the manger, and in the same manner led to the pasture, that they may become acquainted, and accustomed to have one common motion. The goad is never to be made use of in the beginning, as that would only render him more untractable; he must also be indulged, and labour only at short intervals; for till he is thoroughly trained, he tires himself very much; and for the same reason he is to be fed more plentifully than at other times.

An ox is to draw the plough only from his third to his tenth year, when it will be advisable to fatten and sell him, as being then of a better flesh than if he was kept longer. The age of this creature is known by his teeth and horns. The first fore-teeth, which he sheds at the end of ten months, are replaced by others, larger, but not so white; at six months the teeth next to those in the middle fall out, and are also replaced by others; and in three years all the incisive teeth are renewed. They are then equal, long, and pretty white; but as the ox advances in years, they wear, become unequal, and black. It is the same in the bull and cow: so that the growth and shedding of the teeth are not affected by castration, or the difference of sexes. Nor is the shedding of the horns affected by either; as both bull, ox, and cow, lose them alike at the end of three years; and these also are replaced by other horns, which, like the second teeth, remain; only those of the ox and cow are larger and longer than those of the bull. The manner of the growth of these second horns is not uniform, nor the shooting of them equal. The first year, that is the fourth year of the ox's age, two small pointed horns make their appearance, nearly formed, smooth, and towards the head terminated by a kind of button. The following year this button moves from the head, being impelled by a corneous cylinder, which also lengthening, is terminated by another button, and so on; for the horns continue growing as long as the creature lives. These buttons become annular joints, which are easily distinguished in the horn, and by which the age of the creature may be readily known; counting three years for the point of the horn to the first joint, and one year for each of the other intervals.

OX-BOOSE, an ox-stall, or cow-stall, where these creatures stand in the winter.

OX-HARROWS, very large harrows, called, in some counties, drags.

OX-GANG, or *Ox-gate*, a quantity of land measuring fifteen acres, being as much ground as a single ox is supposed to be capable of ploughing in a year.

P.

PACK-SADDLE, a saddle adapted to the carriage of heavy packs or burdens.

PAD, the road, a foot-path; also an easy paced horse: likewise a low saddle.

PADDLE STAFF, an instrument used by the ploughman to free the share from stubble, clay, &c. which hinder its action.

PADDOCK, a small field or inclosure. It also signifies a large frog or toad.

PAIGLE, a cowslip.

PAIL, a wooden vessel in which milk or water is commonly carried.

PALISADE, a row of handsome pales set up by way of ornament or defence. The gardeners use this word to denote a row of trees, which bear branches and leaves from the bottom, cut and spread in the manner of a garden wall, along the side of an alley or the like, so as to appear like a wall covered with leaves.

PALMS, the male flowers of the willow.

PALSY, a disease common to horses, wherein the body or some of its members, lose their motion, and sometimes their sensation of feeling.

In paralytic disorders, where the use of a limb or limbs is taken away, the internals (recommended under the article STAGGERS) should be given in order to warm, invigorate, and attenuate the blood; and the following stimulating embrocation should be rubbed into the parts affected.

> Take oil of turpentine four ounces, nerve ointment and oil of bays, of each two ounces; camphor rubbed fine, one ounce; rectified oil of amber three ounces, tincture of cantharides one ounce.

With this liniment the parts affected should be well bathed for a considerable time, to make it penetrate; and when the hind parts are chiefly lame, the back and loins should

ſhould be well rubbed with the ſame: to the nervous medicines above recommended, may be added ſnake-root, contrayerva, muſtard-ſeed, horſe-radiſh root, ſteeped in ſtrong beer, or wine where it can be afforded. Take the following for an example, which may be given to the quantity of three pints a day alone, or two horns full may be taken after the nervous balls.

> Take ſnake-root, contrayerva and valerian, of each half an ounce, muſtard-ſeed and horſe-raddiſh root ſcraped, of each two ounces, long-pepper two drams, infuſe in three pints of ſtrong beer or wine.

When the horſe is recovering from any of the above diſorders, the following alterative purge may be repeated two or three times, as it operates very gently.

> Take ſuccotrine aloes one ounce; myrrh half an ounce; aſſa fœtida and gum ammoniacum, of each two drams; ſaffron one dram: make into a ball with any ſyrup.

Where a retention of dung is the cauſe of this diſorder, the great gut ſhould firſt be raked thoroughly with a ſmall hand, after which plenty of emollient oily clyſters ſhould be thrown up, and the opening drink given, till the bowels are thoroughly emptied of their impriſoned dung. Their diet ſhould for ſome days be opening, and conſiſt chiefly of ſcalded bran, with flower of brimſtone, ſcalded barley, &c.

PANIC, a plant reſembling millet in its ſtalks, leaves, and roots; but differing in its ſpikes, or ears, which are about the thickneſs of a man's finger at their baſe, and growing taper toward their points. They are about eight or nine inches long, and cloſely ſet with a ſmall roundiſh grain, ſometimes white, ſometimes red or purple, and ſometimes yellow. It is raiſed and reaped in the ſame manner as millet, but does not require ſo much rain. This plant grows naturally in both the Indies, and is cultivated in ſeveral parts of Europe for the food of men. Cakes and bread are made of it in Germany, Italy, and the ſouthern parts of France; but it is not reckoned ſo good nouriſhment as millet: nor is the German ſort ſo much eſteemed as the Italian; though the former ripens beſt in cold countries, where it is frequently ſowed in land which will not produce better grain. It thrives moſt in a dry ſtiffiſh ſoil, ſuch as the ſides of hills, and even in ſtony ground; grows to the height of about four feet, and branches very much; for which reaſon the horſe-hoeing huſbandry is by far the fitteſt for it. The plants, if managed rightly, ſhould ſtand at leaſt eighteen inches aſunder, in rows three feet apart, that there may be room to hoe the ground between them, and to keep them clear from weeds. When grown pretty tall, they ſhould be ſupported by ſtakes, leſt the wind break them down, and particular care muſt be taken to guard againſt birds when their ſeeds begin to ripen.

PANNAGE, the food which ſwine feed upon in woods, as acorns, and the maſt of beech. It alſo ſignifies the money taken by the king's agiſtors, for the privilege of feeding hogs in the king's foreſts.

PANNEL, a low ſaddle.

PARING *the ſole. See the article* SHOEING HORSES.

PARSLEY, the name of a well-known herb, which is cultivated in gardens for culinary purpoſes, it being more uſed in the kitchen than any other herb whatſoever; it will tolerably endure cold, but is apt to be deſtroyed in very ſevere winters, eſpecially where the land is moiſt; it is commonly ſown in the ſpring, and ſends forth a ſtalk the year after, which flowers in June or July, and the ſeeds ripen in Auguſt.

The common parſley is, by ſome ſkilful people, cultivated in fields for the uſe of ſheep, it being a ſovereign remedy to preſerve them from the rot, provided they are fed twice a week, for two or three hours each time, with this herb: but hares and rabbits are ſo fond of it, that they will come from a great diſtance to feed on it; ſo that whoever has a mind to have plenty of hares in their fields, by cultivating parſley, will draw all the hares off the country to them.

PARSNEP, the name of a plant propagated for the ſake of its roots.

Parſneps require a rich, mellow, and deep ſoil; in order that their roots, according to the bigneſs and length of which they are eſteemed, may have full room to thicken and run downward. The ſeeds of theſe plants ſhould be ſown in February or March, either alone, or with carrots, eſpecially if it be intended to draw theſe laſt very young; becauſe parſneps ſeldom ſpread much before the latter end of ſummer, by which time the carrots will, in this caſe, be gone. The practice of thoſe gardeners who ſow leeks, onions, and lettuces with their parſneps, is very wrong; becauſe ſo many different growths muſt impoveriſh one another.

The young parſneps muſt be hoed and weeded, or, if they were ſown in rows, the ground between thoſe rows muſt be dug, three or four times in the ſpring, or whenever elſe many weeds appear. By the latter end of the ſummer, their leaves will cover the ground, and prevent the farther growth of weeds; ſo that they will not require any more care after that ſeaſon.

When their leaves begin to decay, their roots may be dug up for uſe: but they are ſeldom well taſted before that time; nor are they good for much late in the ſpring, after they have ſhot out again. They, therefore, who would preſerve them for ſpring uſe, ſhould dig them up in the beginning of February, and bury them in ſand in a dry place, where they will remain good until the middle of April, or later.

To ſave the ſeeds of this plant in the moſt advantageous way, ſome of the longeſt, ſtraiteſt, and largeſt roots, ſhould be ſingled out, and planted about two feet aſunder, in a place where they will be defended from the ſtrong ſouth and weſt winds: for the ſtems of the parſneps generally grow to a great height, and are very apt to be broken by ſtrong guſts of wind, if they are expoſed thereto. This ground ſhould alſo be kept clear from weeds; and if the ſeaſon ſhould prove dry, watering of theſe plants moderately, twice a week, will increaſe the quantity, and improve the quality, of their ſeeds, which will be ripe about the end of Auguſt or beginning of September, when the heads ſhould be carefully cut off, and ſpread upon a coarſe cloth for two or three days, to dry. The ſeeds ſhould then be beaten off, and put up for uſe. But neither theſe, nor carrot-ſeeds, ſhould be depended on after they are above a year old.

Parſneps are an excellent, wholeſome, and very nouriſhing food for cattle. Their culture, as I have juſt obſerved, is exactly the ſame as that of carrots, with which they may therefore be ſown in the ſame ground. Their leaves will decay at nearly the ſame time, when the roots may be dug up, and laid by for uſe, likewiſe buried in dry ſand, in a dry place.

Parſnep-ſeeds ſeldom grow after they are above a year old.

It has long been a cuſtom in ſome parts of Britany, to ſow parſneps in the open field for the food of cattle; as we are informed by the firſt volume of the tranſactions of a Society inſtituted in that province, for the encouragement of the economical and commercial intereſts of their country. "It is of great importance," ſay they, "that parſneps ſhould be univerſally cultivated; becauſe they afford an excellent and wholeſome food for all kinds of cattle, during the winter, and may be uſed to great advantage to fatten them. Our hogs have no other food in all that ſeaſon, and our bullocks and oxen thrive well upon it. Our cows fed with parſneps give more milk than with any other winter fodder, and that milk yields better butter than the milk of cows nouriſhed with any other ſubſtance. Our horſes fatten with this food; though ſome pretend that it renders them leſs mettleſome, and hurts their legs and eyes.

"Cattle eat theſe roots raw at firſt, ſliced lengthwiſe; and when they begin not to reliſh them, they are cut in pieces, put into a large copper, preſſed down there, and boiled with only ſo much water as fills up the chaſms between them. They then eat them very greedily, and continue to like them."

PARTERRE, a level diviſion of ground, which, for the moſt part, faces the ſouth and beſt front of the houſe, and is generally furniſhed with greens, flowers, &c.

There are ſeveral ſorts of parterres, as plain graſs with borders, and parterres of embroidery, &c.

Plain

Plain parterres are more beautiful in England than in any other country, by reason of the excellency of our turf, and that decency and unaffected simplicity that it affords to the eye of the spectator. Other parterres are cut into shell and scroll work, with sand alleys between them; which sort of parterres are esteemed finest in France.

As to the general proportions of parterres, an oblong, or long-square, is esteemed the best: therefore, a parterre should not be less than twice as long as it is broad; twice and a half is accounted a very good proportion; and it is very rare that three times is exceeded. As to the breadth of a parterre, it is to take its dimensions from the breadth of the front of the house; if the front of the house is one hundred feet long, the breadth of the parterre should be one hundred and fifty feet; and if the front of the house be two hundred feet, the parterre should be fifty feet broader: but where the front exceeds the breadth of this parterre, it will be a good proportion to make the parterre of the same dimensions with the front.

There should be a terrace-walk on each side of the parterre, for an elevation proper for view; and therefore, there should never be the flat of a parterre between terrace-walk and terrace-walk, above three hundred feet; nor can it be well made less than one hundred and forty. As to the adorning and furnishing these parterres, whether it be plain or with embroidery, that depends much upon the form of them, and therefore must be left to the judgment and fancy of the designer.

PARTRIDGE, a timorous and simple bird, and is so valuable at the table, that there are a great many ways of taking it invented by the sportsmen, all of which succeed from the folly and fear of the animal.

The places that partridges most delight in, are corn fields, especially while the corn grows; for that is a safe retreat, where they remain undisturbed, and under which they usually breed. They frequent the same fields after the corn is cut down, and that with another intent; for they then feed on the corn that has fallen from the ears, and find a sufficient shelter for them under covert of the stalks, especially of those of wheat stubble. When the wheat stubble is much trodden by men or beasts, they retire to the barley stubble, and will there hide themselves in coveys of twenty or thirty. When the winter comes on, and the stubble fields are trodden down or ploughed up, they then retire to the upland meadows, where they lodge in the high grass, and among rushes; sometimes they resort to the low coppice woods, especially if there be corn lands near them.

PASSION-FLOWER, the name of a very beautiful plant, having long slender stalks, which run a great length, and require support; they are covered with a purplish bark, and are furnished at each joint with a digitated leaf, composed of five smooth entire lobes, connected with the stalk by pedicles, about two inches long, having two small leaves embracing the stalks at their base; and from the same point comes out a long tendril, which twists round the neighbouring support; the flowers come out at the same joints as the leaves, supported on footstalks almost three inches long; these flowers have a faint smell, and continue but one day; they come out in July, and there is a diurnal succession till the frost in autumn puts a stop to them.

This plant may be propagated either from seeds, layers, or cuttings; they require a good aspected wall; where they may have height for their shoots to extend, which should be properly trained against it; and in the spring the plants must be pruned, when all the small weak shoots should be cut off, and the strong ones shortened to about four or five feet long, which will cause them to put out strong shoots for flowering the following summer.

PASTURE, or *Pasture Land*, a general name for all sorts of land reserved for the purposes of feeding cattle.

Pasture ground is of two sorts: the one is low meadow land, which is often overflowed; and the other is upland, which lies high and dry. The first of these will produce a much greater quantity of hay than the latter, and will not require manuring or dressing so often: but then the hay produced on the upland is much preferable to the other; as is also the meat which is fed in the upland more valued than that which is fatted in rich meadows: though the latter will make the fatter and larger cattle, as is seen by those which are brought from the low rich lands in Lincolnshire. But where people are nice in their meat, they will give a much larger price for such as hath been fed on the downs, or in short upland pasture, than for the other, which is much larger. Besides this, dry pastures have an advantage over the meadows, that they may be fed all the winter, and are not so subject to poach in wet weather; nor will there be so many bad weeds produced; which are great advantages, and do, in a great measure, recompense for the smallness of the crop.

We have already mentioned the advantages of meadow land, or such as is capable of being overflowed with water, and given directions for draining and improving low pasture land, under the article LAND; therefore shall not repeat that here, but just mention some methods for improving of upland pasture.

The first improvement of upland pasture is, by fencing it, and dividing it into small fields of four, five, six, eight, or ten acres each, planting timber trees in the hedge-rows, which will screen the grass from the dry pinching winds of March, which will prevent the grass from growing in large open lands; so that, if April proves a dry month, the land produces very little hay; whereas in the sheltered fields the grass will begin to grow early in March, and will cover the ground, and prevent the sun from parching the roots of the grass, whereby it will keep growing, so as to afford a tolerable crop, if the spring should prove dry. But, in fencing of land, it must be observed, as was before directed, not to make the inclosures too small, especially where the hedge-rows are planted with trees; because, when the trees are advanced to a considerable height, they will spread over the land; and, where they are close, will render the grass sour; so that, instead of being an advantage, it will greatly injure the pasture.

The next improvement of upland pasture is, to make the turf good, where, either from the badness of the soil, or for want of proper care, the grass hath been destroyed by rushes, bushes, or mole-hills. Where the surface of the land is clayey and cold, it may be improved by paring it off, and burning it in the manner before directed: but, if it is an hot sandy land, then chalk, lime, marle, or clay, are very proper manures to lay upon it: but this should be laid in pretty good quantities, otherwise it will be of little service to the land.

If the ground is over-run with bushes or rushes, it will be a great advantage to the land to grub them up towards the latter part of summer; and after they are dried, to burn them, and spread the ashes over the ground just before the autumnal rains; at which time the surface of the land should be levelled, and sown with grass-seed, which will come up in a short time, and make good grass the following spring. So, also, when the land is full of mole-hills, these should be pared off, and either burnt for the ashes, or spread immediately on the ground, when they are pared off, observing to sow the bare patches with grass seed, just as the autumnal rains begin.

Where the land has been thus managed, it will be of great service to roll the turf, in the months of February and March, with an heavy wood roller; always observing to do it in moist weather, that the roll may make an impression: this will render the surface level, and make it much easier to mow the grass, than when the ground lies in hills; and will also cause the turf to thicken, so as to have what the people usually term a good bottom. The grass, likewise, will be the sweeter for this husbandry, and it will be a great help to destroy bad weeds.

Another improvement of upland pastures is, the feeding of them: for, where this is not practised, the land must be manured at least every third year; and where a farmer hath much arable land in his possession, he will not care to part with his manure to the pasture. Therefore every farmer should endeavour to proportion his pasture to his arable land, especially where manure is scarce, otherwise he will soon find his error; for the pasture is the foundation of all the profit which may arise from the arable land.

Whenever the upland pastures are mended by manure, there should be a regard had to the nature of the soil, and a proper sort of manure applied: as, for instance, all hot sandy land should have a cold manure; neat's dung and swine's dung are very proper for such lands; but, for cold lands, horfe-dung, afhes, and other warm manures, are proper. And, when thefe are applied, it fhould be done in autumn, before the rains have foaked the ground, and rendered it too foft to cart on; and it fhould be carefully fpread, breaking all the clods as fmall as poffible, and then harrowed with bufhes, to let it down to the roots of the grafs. When the manure is laid on at this feafon, the rains in winter will wafh down the falts, fo that the following fpring the grafs will receive the advantage of it.

There fhould alfo be great care had to the deftroying of weeds in the pafture every fpring and autumn: for, where this is not practifed, the weeds will ripen their feeds, which will fpread over the ground, and thereby fill it with fuch a crop of weeds as will foon overbear the grafs, and deftroy it; and it will be very difficult to root them out, after they have gotten fuch poffeffion; efpecially ragwort, and fuch other weeds as have down adhering to their feeds.

Thefe upland paftures feldom degenerate the grafs which is fown on them, if the land is tolerably good: whereas the low meadows, which are overflowed in winter, in a few years turn to an harfh rufhy grafs, though the upland will continue a fine fweet grafs for many years without renewing.

There is no part of hufbandry, of which the farmers are in general more ignorant than that of the pafture: moft of them fuppofe, that when old pafture is ploughed up, it can never be brought to have a good fward again: fo their common method of managing their land, after ploughing, is, to fow, with their crop of barley, fome grafs feeds, as they call them; that is, either the red clover, which they intend to ftand two years after the corn is taken off the ground, or rye-grafs, mixed with trefoil: but as all thefe are, at moft, but biennial plants, whofe roots decay foon after their feeds are perfected; fo, the ground, having no crop upon it, is again ploughed for corn: and this is the conftant round which the lands are employed in, by the better fort of farmers; for I never have met with one of them, who had the leaft notion of laying down their land to grafs for any longer continuance; therefore, the feeds which they ufually fow, are the beft adapted for this purpofe.

But, whatever may have been the practice of thefe people, I hope to prove, that it is pooffible to lay down land, which has been in tillage, with grafs, in fuch a manner, as that the fward fhall be as good, if not better, than any natural grafs, and of as long duration. But this is never to be expected, in the common method of fowing a crop of corn with the grafs feeds: for, wherever this has been practifed, if the corn has fucceeded well, the grafs has been very poor and weak; fo that, if the land has not been very good, the grafs has fcarcely been worth faving: for the following year it has produced but little hay, and the year after the crop is worth little, either to mow or feed. Nor can it be expected to be otherwife; for the ground cannot nourifh two crops: and, if there were no deficiency in the land, yet the corn, being the firft, and moft vigorous of growth, will keep the grafs from making any confiderable progrefs; fo that the plants will be extremely weak, and but very thin, many of them, which came up in the fpring, being deftroyed by the corn; for, whenever there are roots of corn, it cannot be expected there fhould be any grafs. Therefore, the grafs muft be thin, and, if the land is not in good heart, to fupply the grafs with nourifhment, that the roots may branch out after the corn is gone, there cannot be any confiderable crop of clover: and, as their roots are biennial, many of the ftrongeft plants will perifh foon after they are cut; and the weak plants, which had made but little progrefs before, will be the principal part of the crop for the fucceeding year: which is many times not worth ftanding.

Therefore, when ground is laid down for grafs, there fhould be no crop of any kind fown with the feeds; and the land fhould be well ploughed, and cleaned from weeds; otherwife the weeds will come up the firft, and grow fo ftrong, as to overbear the grafs, and, if they are not pulled up, will entirely fpoil it. The beft feafon to fow the grafs feeds upon dry land is about the middle of September, or fooner, if there is an appearance of rain: for, the ground being then warm, if there happen fome good fhowers of rain after the feed is fown, the grafs will foon make its appearance, and get fufficient rooting in the ground before winter; fo will not be in danger of having the roots turned out of the ground by the froft, efpecially if the ground is well rolled before the froft comes on, which will prefs it down, and fix the earth clofe to the roots. Where this hath not been practifed, the froft has often loofened the ground fo much, as to let in the air to the roots of the grafs, and done it great damage; and this has been brought as an objection to the autumnal fowing of grafs: but it will be found to have no weight, if the above direction is practifed: nor is there any hazard of fowing the grafs at this feafon, but that of dry weather, after the feeds are fown; for, if the grafs comes up well, and the ground is well rolled in the end of October, or the beginning of November, and repeated again the beginning of March, the fward will be clofely joined at bottom, and a good crop of hay may be expected the fame fummer. But, where the ground cannot be prepared for fowing at that feafon, it may be performed the middle or latter end of March, according to the feafon's being early or late; for, in backward fprings, and in cold land, we have often fowed the grafs in the middle of April, with fuccefs: but there is danger, in fowing late, of dry weather, and efpecially if the land is light and dry; for we have feen, many times, the whole furface of the ground removed by ftrong winds at that feafon; fo that the feeds have been driven in heaps to one fide of the field. Therefore, whenever the feeds are fown late in the fpring, it will be proper to roll the ground well foon after the feeds are fown, to fettle the furface, and prevent its being removed.

The forts of feeds which are the beft for this purpofe, are, the beft fort of upland hay-feeds, taken from the cleaneft paftures, where there are no bad weeds: if this feed is fifted to clean it from rubbifh, three bufhels will be fufficient to fow an acre of land. The other fort is the *trifolium pratenfe album*, which is commonly known by the names white Dutch clover, or white honeyfuckle grafs. Eight pounds of this feed will be enough for one acre of land. The grafs feed fhould be fown firft, and then the Dutch clover-feed may be afterwards fown: but they fhould not be mixed together; becaufe the clover-feeds, being the heavieft, will fall to the bottom, and confequently the ground will be unequally fown.

When the feeds are come up, if the land fhould produce many weeds, thefe fhould be drawn out before they grow fo tall as to overbear the grafs: for, where this has been neglected, the weeds have taken fuch poffeffion of the ground, as to keep down the grafs, and ftarve it; and, when thefe weeds have been fuffered to remain until they have fhed their feeds, the land has been fo plentifully ftocked with them, as intirely to deftroy the grafs: therefore it is one of the principal parts of hufbandry, never to fuffer weeds to grow on the land.

If the ground is rolled two or three times, at proper diftances after the grafs is up, it will prefs down the grafs, and caufe it to make a thicker bottom: for, as the Dutch clover will put out roots from every joint of the branches which are near the ground, fo, by preffing down of the ftalks, the roots will mat fo clofely together, as to form a fward fo thick as to cover the whole furface of the ground, and form a green carpet; and will better refift the drought. For, if we do but examine the common paftures in fummer, in moft of which there are patches of this white honeyfuckle grafs growing naturally, we fhall find thefe patches to be the only verdure remaining in the fields. And this, the farmers in general acknowledge, is the fweeteft feed for all forts of cattle; yet never had any notion of propagating it by feeds: nor has this been long practifed in England; for, till within a few years, that fome curious perfons imported the feed from Brabant, where it had been long cultivated, there was not any of the feeds faved in England: though now there are feveral perfons who fave the feeds here, which fucceed full as well as any of the foreign feeds which are imported.

As the white clover is an abiding plant, fo it is certainly the very beft fort to fow, where paftures are laid down to remain: for as the hay-feeds which are taken from the beft paftures, will be compofed of various forts of grafs, fome of which may be but annual, and others biennial; fo, when thofe go off, there will be many and large patches

patches of ground left bare and naked, if there is not a sufficient quantity of the white clover, to spread over and cover the land. Therefore, a good sward can never be expected, where this is not sown: for in most of the natural pastures we find this plant makes no small share of the sward; and it is equally good for wet and dry land, growing naturally upon gravel and clay, in most parts of England: which is a plain indication how easily this plant may be cultivated, to great advantage, in most sorts of land throughout this kindom.

Therefore, the true cause why the land which has been in tillage, is not brought to a good turf again, in the usual method of husbandry, is, from the farmers not distinguishing which grasses are annual from those which are perennial: for, if annual or biennial grasses are sown, these will of course soon decay; so that, unless where some of their seeds may have ripened and fallen, nothing can be expected on the land but what will naturally come up. Therefore this, with the covetous method of laying down the ground with a crop of corn, has occasioned the general failure of increasing the pasture in many parts of England, where it is now much more valuable than any arable land.

After the ground has been sown in the manner before directed, and brought to a good sward, the way to preserve it good is, by constantly rolling the ground with an heavy roller, every spring and autumn, as hath been before directed. This piece of husbandry is rarely practised by farmers: but those who do, find their account in it; for it is of great benefit to the grass. Another thing should also be carefully performed; which is, to cut up docks, dandelion, knapweed, and all such bad weeds, by their roots every spring and autumn: this will increase the quantity of good grass, and preserve the pastures in beauty. Dressing of these pastures every third year is also a good piece of husbandry; for otherwise it cannot be expected the ground should continue to produce good crops. Besides this, it will be necessary to change the seasons of mowing, and not to mow the same ground every year; but to mow one season, and feed the next: for, where the ground is every year mown, it must be constantly dressed, as are most of the grass grounds near London, otherwise the ground will be soon exhausted. *Miller's Gard. Dict.*

The following Methods of improving wet Pastures, will, we doubt not, be very acceptable to our Readers, as they are founded on Experience, and consequently have no tendency to deceive the Husbandman.

"As I have, says our ingenious husbandman, within a few years, not only had some experience in my own farm, but observed the methods employed by many neighbouring gentlemen and farmers in mending their pastures, I shall communicate a few of my remarks to you on the improvement of wet pastures; a subject which may prove, perhaps, of some little utility, as I shall speak of nothing but what I have either performed myself, or seen hereabouts.

"The particular lands of which I speak are loose, woodcock, brick-earth soils for about eighteen or twenty inches, and under that, clay to a great depth.

Some that I have improved myself were exactly level, so as to be quite poisoned with the wet, which could not drain off.

"From the best observations I could make on many experiments, the following is the method which answers best to improve them. I shall also give you the expence with us.

"The first thing to be done is, to make large, deep ditches round every field, and, if the fields are large, to divide them into smaller, of five, six, or seven acres each, by new ditches; nothing is attended with a more sudden improvement of all the ground near the borders of the fields, than good ditches.

"I generally make mine six feet perpendicular deep, seven wide at top, and three at the bottom. I never pay for them by the rod (which is customary) but give twopence halfpenny per load, of thirty bushels, for all the clay, &c. that is thrown out of them, and two shillings and sixpence a score loads for filling and spreading it.

"These ditches should be made in such a manner that no water can remain in them, but a descent from one to another to carry it quickly off.

"It may be easily imagined how much these must drain the land, besides the quantity of excellent manure (clay) which arises out of them. Add to this the great convenience of having such fences about a farm, that the farmer is sure to find his cattle wherever he turns them, instead of their breaking perpetually into his corn or hay fields, which, in multitudes of farms, is so often the case: it is sometimes the work of a boy, only to be hunting after hogs and sheep that go astray for want of good fences.

"In the banks of new ditches we always lay white thorn, fifty roots to a rod (the workmen are allowed sixpence per hundred for gathering them;) but I always avoid intermixing any thing with it, especially hasel, for in the nut season fences are pulled in pieces for the fruit by all the boys and girls in the neighbourhood; and oak, ash, &c. only give an opportunity to get over the hedge with greater ease. Sallow, willow, elder, &c. are to be avoided in the hedge, or by way of hedge stake for the dead hedge, as they grow so fast as quite to overshadow the quick, and even destroy it. After frequent cuttings, to render the plants thick and strong, I keep the quick regularly clipped, which, in a few years, renders the fence impenetrable to man or beast, considering the largeness of the ditch.

"If an old fence is grown bad and thin, or composed of improper plants, I never yet observed it improved by planting quick in the gaps: the best way is, to reverse the bank, and plant fresh quick.

"One advantage arising from good fences is not apparent at first sight. To the disgrace be it spoken of most of the gentlemen of large fortunes round Bury, the game is wretchedly destroyed by poachers, who take it with night-nets. These vermin, who are generally labourers, swarm in every village round me. Their method is this: they take the farmer's horses out of his fields, and, after their doing a hard day's work, ride them all night, as fast as they can make them go, over the stubbles, to catch the partridges, blundering over every hedge (except such as I have described) in their way, oftentimes staking the horses (of which two instances have I seen this season) making gaps in the fences, riding over standing corn, clover for seed, or any thing that is a cover for birds, and, after damaging the farmer in a most shameful manner, carry the produce of their infamous labour to many, who, to their great dishonour, encourage these rascals for their conveñience. The money they get is spent at the next alehouse, and instead of doing the farmer a good day's work, they are drunk, asleep, or idle, the whole day.

"Now there are very few farmers horses that will leap a gate; but most will plunge through such hedges as are common hereabouts: none could pass such ditches as I always make and recommend. A farmer in this parish has so effectually fenced in his fields with prodigious ditches, that I have heard him declare, that not a single night-netter has been on his grounds on horse-back; and were they to attempt it, they would lose more time in passing one ditch than was necessary to drag some whole farms.

"The pernicious effects, to farmers, of this abominable practice, are notorious, and cry aloud for redress: if they would ease themselves, I know of no way but such ditches as I have described.

"But to return.

"When the ditching is done, the next work is to land-drain the whole fields in such a manner that every part of them may be laid dry. In a pasture of six acres I did two hundred rod. If there is the least fall in any part, or any place more wet than others, the drains should be cut through them. If the surface is exactly level, the depth of the drains should vary, so that the water may every where have a descent.

"These drains are made here, in general, thirty-two inches deep, twenty inches wide at the top, and four wide at the bottom. They are filled eight inches deep with either stones or wood; but I should ever recommend

mend the former, as the moſt effectual and laſting, to thoſe who are not deſirous of ſaving the difference of the expence. However, I know many fields in this pariſh and neighbourhood that are drained with wood, and which anſwer extremely well; and I have been aſſured that they will laſt twenty or thirty years. Nay, in ſome parts of Eſſex I hear they do it with ſtraw alone; but this muſt be of ſervice for only a few years: if ſtone be uſed, there can be no doubt of its laſting. The labour of the whole is three-pence per rod; ſometimes it is done for two-pence halfpenny.

" If with ſtone of the farmers, a load of thirty buſhels will do three rods, which coſts one ſhilling and a halfpenny ſtubbing and picking; ſo the expence of a rod is ſeven-pence, beſides carriage of the ſtone, which will not be much: but if he buys his ſtone, as is much the moſt probable in this country, we may ſuppoſe he muſt go two miles to fetch it, and give a ſhilling for eighteen buſhels ready picked: the carriage is worth a ſhilling more, and reckoning the eighteen buſhels to do a rod and half (which is near the matter) the ſtone of it will coſt per rod one ſhilling and four-pence.

" If buſhes are uſed, a load of forty faggots will coſt if he buys them, or be worth if he has them, five ſhillings, and coſt cutting one ſhilling. They will do ten rods; ſo that the whole expence of doing a rod with them will be ten-pence, and of ſtone one ſhilling and ſevenpence.

" The very firſt year the prodigious advantage of theſe drains appears, eſpecially if the ſeaſon proves wet. The graſs (or corn if in ploughed fields, for it anſwers in all) will be freſh, vigorous, and ſweet, wherever the paſtures are drained.

" I have a field of ſix acres (mentioned above) which by land-draining, ditching, and manuring, is an exceeding good paſture, and has produced two tons and ten hundred weight of hay per acre, in a very good year, and generally thirty-five hundred weight per acre; whereas the paſtures adjoining are ſcarce worth the farming, and let but at ſeven ſhillings per acre, producing ſcarce any thing but a little feed for lean cattle. The ſoil is the ſame in both; the ſix acres, about twelve years ago, being full as bad as the reſt.

" To improve ſuch wet land, nothing can be more advantageous than the clay which is thrown out of the ditches. Eighty loads per acre is the quantity I have laid on, and have been told by ſeveral ſenſible farmers (who clay a good deal) that it is a proper covering; but if nothing is mixed with it, ninety-five or one hundred. I know a piece of graſs-land greatly improved, on which were ſpread one hundred and fifty loads.

" My method is to make a large hill of manure, by firſt laying a quantity of clay regularly on a heap; then placing a thin layer of muck, ſuch as I have, upon it, either my ſtable or rack-yard dung, or bringing it of any kind in my waggon from Bury; on this layer, another thick one of clay; then the ſecond of dung, and ſo on; letting the proportion be about twenty loads of dung to fifty of clay. Theſe heaps, after remaining ſix months without ſtirring, I mix well together by turning them over, which a workman will do at the rate of eight ſhillings for one hundred loads. Let it lie ſix months longer in this ſtate, and then carry it on to the land, paying two ſhillings and ſixpence per ſcore loads for filling and ſpreading. This I take, from experience, to be by much the beſt way of manuring with clay, as it works and impregnates the ſoil much ſooner than alone.

" Whenever I clay arable land, I do it on clover paſtures after the crop of corn is off, managing it in the ſame manner as for paſtures. If it is ploughed in directly, it is ſeveral years before it works; but having a winter and ſummer to diſſolve and powder it, it waſhes into the ſoil more equally, and in a properer ſtate for improvement. *See the article* CHALK.

" Theſe are the principal points to be obſerved in improving ſuch wet, cold, looſe, paſtures as I have deſcribed: ſome that I have quite changed by theſe means were half over-run with moſs and ruſhes; but draining them thoroughly, and claying them, kills all rubbiſh of this ſort, and preſents the farmer with ſo admirable a view of good paſture for dairy or grazing, where ſo lately nothing could live, as is to be equalled in ſcarce any thing of the kind.

" But as all improvement ceaſes to be ſuch when more money is ſpent in it than the advantages will repay, I ſhall in a few words diſplay how far this is from being the caſe here. I will ſuppoſe two or three fields are improved, amounting in the whole to twenty acres.

	l.	s.	d.
" Sixty loads of clay per acre thrown out of the ditches, twelve hundred loads, at two-pence halfpenny per load – – – – –	12	0	0
" I will ſuppoſe ſixty rod of new ditching done, which, before clay is thrown out by the load, will coſt one ſhilling per rod – – –	3	0	0
" Three thouſand quickſets, at ſixpence per hundred – – – – – – –	0	15	0
" Land-draining ſeven hundred rod with buſhes (this is the quantity I have now marked out in a field of twenty acres) at ten-pence per rod	29	3	4
" N. B. I had a great part of my laſt crop of barley killed in this field with the wet: I had therefore a fine opportunity of marking exactly where the drains ſhould be made, which ought, on ſuch occaſions, never to be omitted, were it only for the common water-furrows which are made for every crop. In ſome fields, unleſs ſuch a guide offers, it is very difficult to tell exactly where to make the land-drains.			
" Turning and mixing one thouſand ſix hundred loads of manure – – – –	6	8	0
" Filling and ſpreading one thouſand ſix hundred loads, at two ſhillings and ſixpence per ſcore	10	0	0
" I will ſuppoſe that the work may be done the ſooner if the farmer brings one hundred loads of the four hundred of dung from the neareſt town; and as I have not reckoned the horſes and driver for the clay cart, I ſhall not in the bringing the dung: therefore the expences per waggon load will be, the coſt three ſhillings, boy ſixpence, and turnpike ſixpence. A waggon load is two tumbrel loads (in this country) ſo fifty loads, at four ſhillings, are	10	0	0
Total	71	6	4

" This is three pounds eleven ſhillings and three-pence per acre: and ſuppoſing the profit to laſt but twenty years, although the draining and ditching part will laſt twice that time, and the clay five and twenty as good as at firſt; and the farmers hereabouts ſeldom change their farms, if tolerable ones, living in them their lives, and their ſons after them, with leaſes of ſeventeen, twenty-one, and twenty-five years: ſuppoſing twenty years profit, I ſay, the expences will then be, per acre per annum, three ſhillings and ſixpence halfpenny.

" So ſmall is the expence divided. But now let us conſider the profit.

" Such land as I have deſcribed never lets here for more than ten ſhillings per acre, by far oftener for eight ſhillings, or eight and ſixpence; and it is from my own experience, as well as various obſervations, that I aſſert the ſame land, after the improvements, will let to any tenant for ſeventeen, eighteen, and twenty ſhillings per acre.

" I will ſuppoſe it only ſixteen ſhillings, though I am certain that is conſiderably under the mark: he then gains, in point of rent, ſix ſhillings per acre; and the whole calculation is abſurd, if we do not add his whole proportional profit on the acre: ſuppoſing his profit on it before improvement was a rent, ten ſhillings; afterwards, it will undoubtedly be the ſame at leaſt; which adds ſix ſhillings more to the profit; ſo that the whole will be twelve ſhillings per acre per annum, or eight ſhillings and ſixpence clear, after the improvement is paid.

	l.
" Twelve ſhillings per acre is per annum, for twenty years – – – – – – – –	240
" Expences of improvement – – – –	71
" Clear profit – – – – – – –	169

" Or

"Or eight pounds nine shillings per annum: and if we reckon five per cent. interest for the seventy-one pounds, that is, three pounds eleven shillings per annum, which, deducted from eight pounds nine shillings, leaves four pounds eighteen shillings per annum absolute profit.

"Thus, I think, I have stated the case of this improvement clearly; and I must repeat it, that I speak from experience. The sum to be expended on twenty acres will appear large to most farmers, whose property is not considerable; but the proportion holds for a single acre, and those who cannot afford to improve twenty, may three, four, or five; and I make no doubt but such as attempt it will find their account in it greater than I have stated it.

"As I have mentioned a tumbrel-load to be thirty bushels, and a waggon load to be but two tumbrels, I should observe that we carry away of muck fifty bushels at a time in our tumbrels, and so agree with our men in proportion to the thirty bushel loads.

"I have observed, that in making new ditches, or enlarging old ones, I never pay by the rod, but by the load: however, to those who chuse the former way, I would recommend that they have them worked by a frame of small fir deal, nailed into the exact size of the intended ditch, and agree with the workmen to do their work by it: this will prevent disputes which frequently arise."

PATE, a brock or badger.

PEACH-TREE, a genus of fruit-trees well known, and said to be natives of Persia.

This tree, in England, grows to a tolerable size; is generally trained against walls, &c. being too apt to miscarry of its fruit when planted as a standard; when grown old it has a pretty thick stem, with many brittle branches, and a redish and brownish bark; the leaves are thin, oblong, acuminated, and for the most part crenated on their edges, having a bitter taste; the flowers appear in the beginning of the spring before the leaves, and are without pedicles, for they adhere to the tubercles of the branches, and are rosaceous, consisting each of five oblong oval petals inserted in the cup; they are of a light pink colour, and in the middle are many stamina; the flower is succeeded by a well known globular, furrowed fruit, covered with a thick soft whitish down. In England there are several sorts or varieties cultivated, as 1. The white nutmeg peach, this is ripe in July. 2. The red nutmeg, this ripens about the beginning of August. 3. The early purple, this is ripe by the middle of August. 4. The French mignon; this is a most excellent melting peach, and ripens about the middle of August. 5. The red magdalen; this peach is ripe about the end of August. 6. The early Newington ripens the end of August. 7. The noblest; this is a fine melting peach, and ripens the end of August. 8. The chancellor, a good melting peach, and ripens the end of August. 9. The admirable; this peach parts from the stone, and ripens the beginning of September. 10. The old Newington; this peach adheres to the stone, and is reckoned one of the best sort. 11. The Portugal peach; this has a rich juice, and adheres to the stone, these ripen about the middle of September. 12. The nivette; this is a melter, and ripens in September. 13. The pavy of pomponne, is a very large fine peach, and ripens in October. 14. The Catherine; this adheres to the stone, is a high flavoured peach, and ripens in October: there are various other sorts, which might be enumerated; but the above-mentioned being of the best and richest flavour, we think it will suffice. The French distinguish those we call peaches into two sorts, viz. pavies, and peaches; those are called peaches which separate from the stone, and those whose flesh closely adheres to the stone are called pavies; these are much more esteemed in France than the peaches, though in England the latter are preferred to the former by many persons.

The best expositions for peach trees, are the south, south-east, and south-west, but they will do tolerably well on a west wall, which ripens its fruit just as those of the south are gone; they should not be planted in a cold wet soil, the fruit in such places are always watery, and insipid; the best soil for these, is fresh untried earth, which is neither too stiff nor too moist, but of a kind loamy nature; and if the earth in the borders is exhausted where the trees are intended to be planted, it should be taken away, and its place supplied with fresh; all the sorts of peaches are propagated by inoculation on plumb-stocks, and trained in the nurseries for planting against walls, &c. but it is certainly best to make choice of such trees, which are of one year's growth from the budding, as they will soon overtake in growth those which are called trained trees; the best time to transplant them is in autumn, when the leaves are turned yellow, when they will have time to form fresh roots, before winter, and thereby be better prepared to shoot more vigorous in the spring; but the head should not be cut off at that time of planting; but if the soil is very moist, it is better to plant in the spring just as the sap begins to be in motion: in February the tops of the trees should be cut off within four or five eyes of the place of inoculation; and when the weather becomes hot and dry, it may be necessary to water the trees: in May the young shoots will have made some progress; those which have a fore-right direction, should be displaced, and the others nailed horizontally to the wall; this must be repeated as often as it is necessary: in October, the branches should be shortened in proportion to the strength of the tree, a vigorous branch may be left nine inches or a foot long, but if the shoots are weak, half that length is sufficient; observing to train them horizontally, as the middle of the tree will easily furnish itself with branches: the second summer, they are to be managed as the first, displacing all fore-right shoots as they are produced, and nailing in the others close to the wall horizontally; but the shoots should not be shortened in the summer, unless in those places where there happens to be vacancies: in October, shorten the shoots as before directed, and the following year's management, is much the same as the preceding. The time for pruning is at the above-mentioned time, where the trees are planted in a dry soil; but if the land is moist, it is better to defer it till the spring.

When peach-trees hasten to bear very soon, it is a sign of decay, or weakness, the best help for them is to disburthen the tree of its bloom, pruning it short, and keeping it well watered in hot weather; but when the trees are vigorous, cut out such large branches as appear to be useless, and nail in the remainder at a good length; and in making choice of shoots, always choose the middling wood as are full of swelling double buds, for those produce fruit, which the flat single ones do not, their product being wood and leaves only; the distance these trees should be planted, may be about sixteen feet: when the fruit is set and grown to the bigness of a small nut, they should be thinned, leaving them at least five or six inches asunder, for when they are permitted to remain in bunches, as they are often produced, the nourishment which should be employed wholly to the fruits designed to stand, will be equally spent amongst the whole number, a great part of which must be afterwards pulled off, so that the sooner this is done, the better it will be for the remainder; and if it should sometimes happen, that a part of those left, by any accident should be destroyed, yet the remaining ones will be much the larger, and better flavoured for it, and the trees will gain more strength; for a moderate crop of fruit, is always preferable to a great crop; for when the trees are overcharged with fruit, it is always small, ill tasted, and the trees are generally so much weakened thereby, as not to be in a condition for bearing well for two or three years afterward.

The following curious and useful observations on the pruning of peach-trees, are extracted from a French treatise, entitled, *Traite de la Culture de Peches*; and will, we hope, prove agreeable to our readers.

"The best time, says this author, for pruning is when the blossom-buds first begin to smell; for then you may discover which blossom promises the fairest for producing a fruit.

"That you may not run the hazard of breaking off such buds as you should wish to preserve, do not offer to prune a twig till the tree is entirely unnailed from the wall.

"Your method of pruning must be regulated by the age, health, and vigour of the tree, and in some sort must humour what has been already done.

"I will begin with the tree in its first year: if it has made but weak shoots, you first reduce its shoots, leaving from two to four on each ſide, oppoſite to each other, and prune them to the length of five or ſix inches. If you find a ſmall bearing branch that looks exceedingly flouriſhing in the middle, you may leave it; but unleſs it is remarkably promiſing, cut it off, for the middle of the tree is ſure to be filled if you prune the ſides properly: and the whole beauty and goodneſs of the tree abſolutely depends upon your right treatment of it for the two firſt years.

"If your tree has thrown out in a good place, on each ſide, one ſtrong branch, prune it to eight or ten inches, leaving here and there a bearing branch.

"It is the way with many gardeners, who look on theſe ſtrong ſhoots as blood-ſuckers, to lop them off without mercy; but this ought to be done with diſcretion, for it is not uncommon for a tree, ſo ſeverely handled, to languiſh and pine away, and from that luxuriant ſtate to dwindle to nothing: the reaſon I take to be this, that, as in all trees the root bears a proportion to its head, the ſap, being here repelled, becomes ſuperfluous and putrid in the root.

"Experience has taught me, that by pruning ſuch kind of trees with judgment, they will, in two or three years, be brought into order: but if they ſtill continue to throw out ſuch ſtrong wood, I ſhould adviſe the ſtopping all ſuch ſmaller branches of the year, which have been thrown out on the ſides, in order more effectually to ſpend the ſap: by this means the exceſſive luxuriance of the tree will be moderated, and much good bearing wood procured.

"The only inconvenience to be apprehended from this practice, and what ſhould be carefully guarded againſt, is, that the lower part of the tree is apt to become bare; but this may be remedied by an attention to pinch off the tops of the ſhoots in the month of May, and to lighten the head well when you prune it.

"If there is one of theſe woody branches on the ſide, and one in the middle of the tree, they muſt both be taken entirely off, or the weak ſide will be totally overpowered, and the tree can never be brought into any handſome form: you muſt then likewiſe prune the leſſer branches, that the two ſides may be kept as equal as poſſible. Here I muſt obſerve, that none of theſe ill-placed branches would be ſeen, for by lightening the ſtrong ſide, the ſap would naturally find its way to the other; but, as few people will take this trouble, we muſt find ſome means of repairing the damage incurred by ſuch neglect.

"This is the method to be followed for the firſt year. Let us now proceed to the ſecond, and ſo on.

"I have ſpoken ſufficiently of ſuch trees as run into wood, whoſe redundancy muſt be moderated before they will throw out any bearing branches, and by what means it may be done: as to thoſe that are moderate, they muſt be treated proportionably; but, above all things, care muſt be taken to keep the middle of the tree ſhort, and the ſides perfectly equal: let no flattering promiſe of fruit induce you to deviate from this rule.

"In regard to the good management of the tree, let two or four proper branches be, as it were, the parents of the reſt; over theſe you muſt be particularly watchful: let them ſpread, and have all the ſpace you can think they will poſſibly cover: they may be allowed from twelve to fifteen inches when you find them of a reaſonable ſtrength. As to the leſſer, they ſhould be left ſix or eight inches long, as you think the vigour of the tree will bear, and the ſpace to be occupied requires; and according as the bloſſom-buds are more or leſs diſtant from the foot of the branch, your own prudence muſt direct you to leave the ſhoot longer if neceſſary.

"Take care to preſerve ſuch bloſſom-buds as come out with a leaf-bud between them: thoſe which come ſingle, though with a leaf-bud by the ſide, will rarely ſet, or come to perfection: notwithſtanding they look very promiſing, never ſuffer yourſelf to be tempted, by a proſpect of abundance of fruit, to allow too many to remain on the tree; for by this means you waſte the ſtrength of it, and, in the end, ruin both the middle and ſides.

"As to ſlender, ill-ripened branches, I reject them all; as alſo thoſe tender twigs which are ſo much reſpected by the generality of gardeners; that is, ſuppoſing I have well-ripened wood of a moderate ſize (not too large) ſufficient for my uſe, it being inconteſtibly proved, that ſuch good wood will nouriſh the fruit beſt, and bring it to the higheſt perfection. I would not be underſtood here to reject thoſe little ſpurs which are only an inch or two long, and are cluſtered like noſegays; no, theſe are to be preſerved with the utmoſt care, as they generally produce the fineſt of fruit.

"There is a good uſe to be made of the branches which I here condemn, namely, to prune them down to the laſt eye, when they are in a place which may poſſibly become bare in future time: one of theſe branches, ſo pruned, may, in the next year, produce a better, which, if it is not wanted, may again be reduced, and ſo on, till it ſhall be deſirable to make uſe of it.

"It will be always found uſeful to have ſome of theſe branches in reſerve in all parts of the tree for a ſupply, in caſe of blight, or when a branch has bore too much fruit the year before; and for that reaſon I ſhould adviſe the cutting even a good branch for this purpoſe, when others are wanting.

"As all trees naturally ſhoot upwards, you muſt uſe your utmoſt diligence to keep the bottom part full of wood, which is only to be effected by proper pruning, and laying the branches exactly even, and quite horizontal: great attention muſt be given to this; for a crooked, or bent branch, or one laid over another, will never produce good fruit.

"On the art of pruning depends the duration of the tree; and it conſiſts in not overcharging it, and keeping it in all parts full: this may appear very eaſy, but it is attended with difficulty, as to the choice of what is to be preſerved, and what rejected, and as to the keeping of promiſing bloſſom-buds, and not preſſing the tree too much if it has bore greatly the preceding year.

"Now let us paſs on to the time when the tree ſhall be found in its full beauty and vigour.

"Suppoſing it has been managed after the method I preſcribe, after it is unnailed, examine into the branches which bore the laſt year: theſe are eaſily diſcovered by their leanneſs, and the poor ſhoots which they have made. I cut them quite cloſe to the large branch from which they ſpring, unleſs they have by chance thrown out ſome very promiſing wood, which may be worthy of preſervation, eſpecially if there is nothing in the neighbourhood to take up the place; then I go to the ſhoots of the year, and cut out all the very ſtrong woody ones, and the very ſmall ones, preſerving only thoſe of a moderate ſize, and the little cluſters or noſegays, before-mentioned.

"If I muſt, out of neceſſity, keep any of the weak ſhoots, I juſt top them about the thickneſs of a crown-piece: this done, there remains nothing but branches of equal ſtrength and goodneſs, and I can ſee clearly what I have to do.

"My only buſineſs now is, to make choice of what I ſhall preſerve of the remainder; and this is my rule:

"Of all the ſhoots which are made from the wood pruned laſt year, I leave only one lower ſhoot; and by the precaution I have uſed in the month of May, by nipping the tops of the others, that will be found by far the beſt, or rather the only good one.

"As for ſuch as neglect this operation, they muſt make the beſt choice they can.

"After this I go over it a third time, and examine whether the tree has borne much fruit the laſt year, that I may prune accordingly. The magdalene is generally a vigorous tree, and will bear a greater burthen than ſome others.

"If my trees of every ſort have not been too much exhauſted, I prune to the length of eight inches, if the place will allow it; but if I am confined, and have nothing below to ſupply the place of a waſted branch, I ſhorten it to three or four inches.

"It will generally be found, that half my branches are ſhort, and half long, according to their ſituation; by which I am enabled to keep the tree always full of good wood without preſſing it to its hurt.

"I have ſaid, that I never leave more than one ſhoot on the laſt year's branch; but in caſe a blight has killed the neighbouring branch; or there appear two ſhoots on the lower part, ſo very equal in goodneſs that there can be no choice between them, I then prune to the length of five or ſix inches: but if I have not an abſolute neceſſity for both for preſent uſe, I prune the higheſt of the two to the length, and cut the loweſt quite down to its firſt eye, in order to inſure to myſelf a proviſion for the next year."

Our author next treats of budding, or nipping off the buds; from which we ſhall ſelect a few paſſages, which cannot, we think, fail giving pleaſure to our readers.

"What I ſhall here call nipping of trees, is an operation of all others the moſt important, and at the ſame time one the moſt of all neglected: when I ſay the moſt important, I mean to except the pruning. The uſe of nipping is this, that it helps and forwards all other operations, and gives to the fruit theſe three advantages, their certainty, beauty, and goodneſs.

"The proper time for nipping is the month of May, when the buds are ſufficiently formed for you to aſcertain your choice, and ſtill tender enough for you to nip them off with your finger and thumb, without any other inſtrument. This nipping is uſually confounded with two other operations, which are called pinching and ſtopping, becauſe they are generally all performed together; but I ſhall diſtinguiſh them, the one from the other.

"All the management of peaches (as I have ſaid before) may be determined in theſe two objects, namely, the good figure of the tree, and its abounding with good fruit: to accompliſh this, all your work ſhould tend.

"With this view therefore you are to diveſt it of all that may be uſeleſs or hurtful; and I muſt call all uſeleſs which is ill ſituated, though in itſelf good, and all hurtful which is ill in itſelf.

"Theſe two evils we muſt guard againſt, and they will be particularly found on the branches, which are pruned the year before; and theſe branches, according to my method, are moſt of them ſix or eight inches long, there will be found on them from eight to ten eyes, which are as many branches: ſuch a number of branches cannot poſſibly be equally well nouriſhed, and muſt, of courſe, breed confuſion.

"I reduce them, according to their ſituation, to two or three, which I chuſe on the loweſt ſide, oppoſite to each other, and the end one, provided the fruit is there, and that it is not lower.

"If the fruit is only ſet on the lower ſide, or if it is ſet all the way along it, where the number of eyes may be from eight to ten, in both caſes I reduce them to half their number, and preſerve only three or four of the moſt promiſing, always obſerving to leave at the end a fair young branch of the year.

"At the ſame time I pinch off with my nail ſuch branches as accompany the fruit, to the thickneſs of about two crown-pieces, which I call ſtopping: and if there are others which have not fruit, I pull them quite off, reducing the number to two or three.

"If the branch has not thrown out any fruit, I prune it down to the ſecond bud; that is to ſay, I only preſerve the two loweſt buds, unleſs the tree is too luxuriant, and it becomes neceſſary to leave more in order to conſume the ſap.

"With reſpect to ſuch branches as I have pruned ſhort, I preſerve only two of the new ſhoots, the uppermoſt and its oppoſite: I ſuppreſs all others which have not fruit by them; ſuch as have, I pinch them; but if the fruit fall off, I ſerve them all after the ſame faſhion: ſometimes, however, I leave only one of theſe new ſhoots, and it muſt be always the loweſt.

"If I find a woody, ſtrong ſhoot on the branch pruned laſt year, or even if it ſhoots from the body of the tree, I conſider whether it will weaken the tree, be detrimental to its neighbour, or not of immediate ſervice: if it anſwers no purpoſe, I take it entirely off.

"But if it may hereafter be found uſeful, either to fill a vacant place, or to waſte the ſap which too much abounds, I pinch it down to four or five leaves; and as there comes a new ſhoot from every leaf, I ſhall find preſently as many free ſhoots, of a moderate ſize, out of which I may chuſe, in the firſt nailing, ſuch as promiſe beſt. As to the weak ſhoots which come from the old wood, I ſuppreſs them entirely, unleſs they come opportunely to fill a preſent vacancy, or are deſirable for a future reſource; but the little cluſters, or noſegays, I always preſerve, let them be where they will.

"Great regard ſhould be paid to the bottom part of the tree, as it often puts forth good ſhoots, which will be found very convenient to ſupply ſuch wood as is exhauſted with bearing: theſe I preſerve with the utmoſt care, and, if they are ſtrong, pinch them off to five or ſix eyes. As for thoſe craving ſhoots which are to be known by their bright-green colour, with here and there red ſpots, and by their ſize, they muſt be wholly taken off, unleſs they are abſolutely neceſſary to fill a vacancy, and that you are without other reſource: if ſo, you muſt pinch them now, and again in the month of June.

"It generally happens, that from one eye, eſpecially that at the extremity of the laſt year's pruning, three ſhoots will come forth of nearly the ſame ſtrength: chuſe only one of them, and let it be that which is beſt placed.

"When you meet with twin fruit, take off the leaſt of them with all poſſible care not to ſhake the other: by this means you have a chance of having one good fruit, and if both are preſerved, neither will be ſo.

"Theſe are the chief points which relate to the nipping. The next thing is to ſhew the advantages it produces.

"It may eaſily be comprehended that theſe retrenchments, made in the proper time, are likely to ſtrengthen ſuch as are left, both fruit and branch, as, from a moderate ſhare of nouriſhment, they will by this means enjoy a better, till they are made perfect.

"Nay, more, it is poſſible that what you have retrenched of the ill-placed branches, which you muſt have cut off at the firſt nailing, might have been more favoured by the ſap, and have robbed the well-placed branch, which, by being left alone, now enjoys the whole of the nouriſhment, and becomes ſtrong and vigorous.

"By theſe retrenchments you reap this further advantage, that when you come to the nailing, inſtead of being obliged to clear with the pruning-knife, you have theſe branches ready cleared to your hand; by which you are ſaved an infinite deal of trouble, which the confuſion of ſuch a multitude of ſhoots occaſions, and are ſpared the diſagreeable ſight of abundance of ſtumps, which the ſummer-pruning muſt neceſſarily produce, and occaſion a deal of buſineſs when you come to the winter-pruning, unleſs you unadviſedly leave them on.

"It often happens likewiſe, that theſe naſty ſtumps, left at the time of nailing, throw out two or three ugly ſhoots, which waſte the ſap, breed confuſion, and ruin the fruit.

"It farther happens, that by your efforts to take off theſe ſuperfluous and ill-placed branches with the pruning-knife, and the uncertainty you work in, you rub off many of thoſe fruits which you would wiſh to preſerve, they being then paſt danger.

"By this nipping, which I ſo much recommend, you avoid the following inconveniencies, which the fruit hid, ſtifled, and, as it were, buried in leaves, would be ſubject to, namely, being made too tender, which may plainly be diſcerned by its whitiſh colour; and when it comes to be expoſed ſuddenly to the free air, joined to the ſtrong rays of the ſun, which are new to it, it is moſt probable that the greateſt part of them will wither and fall; for you muſt obſerve, that, as the ſap always puſhes forward to the extremity of the branch, and as only theſe extremities enjoy the benefit of the free air, the lower part of the branch, being ſmothered, caſts its leaves, or ſo great a part of them, that the fruit at beſt is but covered by halves.

"None of theſe inconveniencies will happen, if your branches have enjoyed the free air, in their whole length, and your fruit hath been early enured to the little inclemencies of the weather; for by making them hardy, by the time they arrive at the ſize of a wall-nut, you will ſcarcely find any fall, unleſs they are too many for the tree to nouriſh: you have this further advantage by an early expoſure of the fruit, which is, that the inſects, particularly ſnails, will not be ſo fond of it, as when made ſo tender by being covered with leaves.

"Regard muſt be always had to ſet ſuch fruit and branches at liberty as are confined by the nail; for if once a fruit is become deformed, no art will then reduce it, and a deformed fruit will never be well flavoured.

"It

"It will here be neceſſary to ſpeak of blights, which, by knotting the branches, and enlarging them improperly, ſwallow up the ſap you want to nouriſh the tree.

"When the trees are ſo attacked, you ſhould not only take off all the infected leaves, but likewiſe cut away the branch beyond the infected place: by this you give the ſap the power of going into new ſhoots, which will be equally uſeful another year.

"If your tree be infected to a great degree, your expectation of fruit for that year muſt not be great, for they will fall by degrees before they come to perfection.

"The ants and lice will ſometimes occaſion the ſame diſorder among the leaves and branches; and in that caſe you muſt uſe the ſame means as directed above; but generally theſe inſects are inveterate in poiſoning the eyes of branches, ſo that the ſap is obſtructed.

"If the tree ſhould be attacked with the gum, you ſhould prune it at leaſt an inch beyond the grieved part, which will prevent the deſtruction of the whole in cutting off the communication: from this you will have a ſhoot or two which will ſupply the place, and your loſs will be but trifling.

"The laſt and greateſt advantage of nipping is, that you will find an ample compenſation for all the time you have ſo employed when you come to nailing, as you will ſee your work clearly before you, and every branch will naturally take the place that you would deſire to put it into, and you will ſcarce need to make uſe of the knife.

"I have experienced, that I can ſooner nail three trees which have been nipped than one which hath not.

"Notwithſtanding this operation may have been carefully performed, your work muſt be reviewed every eight or days, as well to deſtroy the vermin, as to take off any ſuperfluous or ill-placed ſhoots, which may put forth after a ſhower of rain; or when the morning-dew is on the tree, is the moſt likely time to find the ſnail at work.

"Regard muſt alſo be had to ſtop the ravages of the gum, and you will find that time ſo employed is by no means thrown away.

"For thoſe that are maſters of their time, it is as well to divide the operation of nipping in this manner: in the end of April I would take off ſuch ſhoots as come behind and before the branch; and in the latter end of May, when the fruit is ſet, I would perform the reſt.

"Theſe rules which I have now laid down, for the well-pruning by the hand, ſtill demand that I ſhould make ſome diſtinction as to their ages.

"For trees in their firſt year, I begin by taking off the backward and fore-right ſhoots at the latter end of April, and only leave ſuch as come on the ſides; and if one ſide has put forth more ſhoots than the other, I diſcharge that ſide in order to drive the ſap to the other: and at the end of May I make a ſecond review, and if I find one branch a great deal ſtronger than the other, I cut or pinch it off.

"Nearly the ſame method may be purſued for the two or three following years, obſerving this difference, that if the tree be vigorous, I relieve it much leſs in nipping than if it is weak; for I would only diſcharge a vigorous tree of the ill placed and fore-right ſhoots which are put forth on the ſtrong branch left at the laſt pruning, preſerving always ſuch as come on the ſides, as many, at leaſt, as I can poſſibly find room for on my wall.

"As for an old tree, I not only take off the ill-placed ſhoots, but likewiſe all ſuch as are weak to a certain degree; and, in order to ſtrengthen the reſt, I confine myſelf to a ſmall number of the beſt ſhoots, on which I leave but a ſmall quantity of fruit.

"I nip ſuch trees the laſt of all, becauſe they are later in coming out."

PEAR, a genus of fruit-trees, ſaid to have been originally brought from Alexandria, Numidia, Greece, &c.

As the ſpecies are very numerous, we ſhall only mention a few of the beſt, viz. 1. the little muſk-pear, which ripens in July; 2. the jargonelle, this is one of the beſt ſummer-pears; 3. the Windſor-pear; 4. the blanquette-pear; 5. the red orange-pear; 6. the royal-pear; 7. the ſummer-boncretien; 8. the rouſſellet; 9. the princes-pear; 10. the ſummer-bergamot; 11. the autumn-bergamot; 12. the brown-beurré; 13. the monſieur John; 14. the flowered-muſcat; 15. the green ſugar-pear; 16. la marquiſe; 17. the craſſan; 18. the colmar; 19. the vert-longue; 20. the virgoulé; 21. the winter-thorn; 22. the St. Germain; 23. the winter-rouſſelet; 24. the Eaſter-bergamot; 25. the Hollands-bergamot; 26. the winter-boncretien; 27. the Chaumontelle. (The following are baking-pears) 28. the pound-pear, or black-pear of Worceſter; 29. the winter citron-pear; 30. the francreal; 31. the double flowering-pear, with many other ſorts: they are all propagated by budding or grafting upon ſtocks of their own kind (commonly called free-ſtocks) or upon quince-ſtocks; the latter are uſed for low walls, dwarfs, or eſpaliers; and eſpecially in wet lands, theſe ſtocks doth effectually prevent the too great luxuriancy of the plant, and cauſe it to produce fruit much ſooner than on a pear ſtock; but then, on the other hand, it has this evil attending it, that the tree is but ſhort-lived, and moſt of the ſorts of hard baking-pears are rendered ſtony and good for little: on the contrary, moſt melting ſoft pears are greatly improved by being grafted on quince-ſtocks, particularly if the ſoil is of a moiſt ſtrong nature.

The beſt ſeaſons to prune pear-trees is at the fall of the leaf, though it may be deferred till the ſpring, obſerving to cut out all luxuriant branches, which are known by the great diſtance of their buds, and to lay in no more wood than the roots may be reaſonably ſuppoſed capable of ſupplying with ſufficient juices, leaving them at a diſtance from each other, in proportion to the ſize of the fruit; ſuch ſorts whoſe fruit are ſmall may be allowed five or ſix inches, but the larger ones muſt be not leſs than ſeven or eight inches aſunder, always remembring to train the branches horizontally as they are produced, without topping them, by which means there will be little occaſion for much pruning theſe trees; for it appears, that pear-trees have their bearing-buds in three different ſtates, continually ſucceeding each other; the blowing-buds of three years old diſcover themſelves at the fall of the leaf, which, whilſt the fruit preceding them was growing and ripening, they were preparing to ſucceed them the enſuing year: theſe buds are produced upon curſons or ſpurs, and are known by their being very full and larger than the others, in a ſeeming ſwelling impatient ſtate of breaking out into its beautiful dreſs of delightful bloom, which is enwrapped within it: the preparative buds of two years are of a ſharp conic figure, and red ruſſet colour, growing very near the fruitful buds before deſcribed: the junior buds of one year are very ſmall, but full above the bark, and always break out near the buds of two years growth; to which may be added, there is a continued ſucceſſion of buds in embryo, ad infinitum.

The diſtance pear-trees ſhould be planted, either againſt walls or eſpaliers, ſhould not be leſs than thirty feet, for if they have not room to ſpread on each ſide, it will be impoſſible to preſerve them in good order, eſpecially thoſe on free ſtocks, for the more theſe trees are pruned the more they will ſhoot: many ſorts of pears produce their bloſſom-buds at the extremity of the ſhoots; ſo that when they are ſhortened the fruit will be cut away, which cannot be avoided where the trees have not room allowed in their firſt planting.

The beſt ſeaſon for planting pear-trees in a dry ſoil is at autumn, but if the land be moiſt the ſpring is to be preferred.

PEASE, a genus of plants cultivated in every part of England both in the field and kitchen-garden. We ſhall lay down the beſt methods for cultivating them in the kitchen-garden, from Mr. Miller's Gardener's Dictionary, and then proceed to give the beſt inſtructions in our power for obtaining large crops in the field.

With regard to the kitchen.—The diſtance between the rows of peas ſhould be proportioned to the ſize to which they grow. The channels in which they are ſown ſhould be about two inches deep; and the quickeſt and moſt regular way to perform this work is, to draw a ſmall hoe, directed by a line, along the ſurface of the ground, ſo as to open a drill, then to ſcatter the ſeeds in this furrow, and to earth them over with the help of a rake. By this means they will be well and equally covered; which is eſſentially neceſſary, becauſe if any of them lie above ground, they will attract mice, rooks, pigeons, and other birds, which will then ſoon find out the reſt, and

deſtroy

deſtroy the whole plantation. The chief trouble after ſowing them is, to ſtick the larger ſorts which require ſupport, to keep the plants clear from weeds, and to earth them up; both which laſt parts of their culture are very eaſily, readily, and effectually executed when a ſmall plow can be introduced between the rows.

The names of the principal ſorts of garden peas now cultivated in England, and the order in which they naturally become fit for gathering, are as follow, viz. the golden hotſpur, the Charlton hotſpur, the Reading hotſpur, the maſter's hotſpur, the Eſſex hotſpur, the dwarf pea, the ſugar pea, the Spaniſh morotto, the nonpareil, the ſugar dwarf, the ſickle pea, the marrowfat, and the roſe, or crown pea: for the rouncival, the common white pea, the gray pea, the pig pea, and ſome other large winter peas, as they are commonly called, ſeldom find a place but in the field. But I muſt here obſerve, that ſeveral of the above-mentioned, which gardeners and ſeed-men have diſtinguiſhed by different appellations, are, in fact, only ſeminal variations, which will degenerate into their original ſtate in a few years, if they are not very carefully managed. The only way to prevent this, is to rogue them, as the gardeners term it, that is to ſay, to examine attentively thoſe which are intended for ſeeds, at the time of their beginning to flower (but before the flowers are open,) and to draw out all the bad plants from among the good ones, that the farina of the former may not impregnate the latter, and thereby make them change. It is chiefly owing to this particular care, and to the ſelecting of thoſe plants which bloſſom earlieſt, that the culture of peas has been very greatly improved of late years around this metropolis, and that, from a continuation of the ſame induſtrious endeavours to bring it to ſtill greater perfection, we may hope to ſee yet forwarder varieties of this moſt uſeful ſpecies of pulſe.

The hotſpur pea is, naturally, the earlieſt of all, and therefore I have named it firſt: but the gardeners about London raiſe, by art, from the dwarf pea, tranſplanted into a hot-bed, a crop which anticipates the ſpontaneous growth of the other. To effect this, they ſow their dwarf peas in warm borders, under walls or hedges, about the middle of October; and when the plants are riſen, they draw the earth up gently around their ſtems, to protect them from the froſt. They let them remain where they were ſown till the latter end of January, or the beginning of February (ſtill continuing to earth them up from time to time, as they advance in growth, and covering them with dry haulm, or ſtraw, in caſe of ſevere froſt,) and then remove them into a hot-bed made of good, new, well fermenting dung, properly mixed, that the heat may not be too great. This dung is laid from two to three feet thick, according as the ſeaſon is more or leſs advanced; it is covered with ſix or eight inches deep of light and freſh, but not too rich, earth; the frames, about two feet high at their back, and fourteen inches deep in front, are then put on, and covered with their glaſſes, which are propped up every day, during three or four days, to let the riſing ſteam paſs off; and when the bed is become of a moderate temperature, the plants are taken up as carefully as poſſible, to preſerve the earth about their roots, and planted in it about an inch aſunder in rows two feet diſtant from each other. They are then watered a little and ſhaded, till they have taken root, and aired whenever the ſeaſon is favourable, leſt they ſhould be drawn up very weak, grow mouldy, and decay. Their ſtems are alſo earthed up as they advance in height, and they are kept perfectly clear from weeds. This firſt watering ſhould be gentle, and dealt out ſparingly; for too much of it would make them grow rank, and ſometimes rot them off at their ſhanks, juſt above the ground. If the weather becomes very hot, the glaſſes are covered with mats in the day-time, to ſcreen the plants from the too great violence of the ſun; and when they begin to fruit, they are watered oftener and more copiouſly than before; for they have nearly done growing by that time, and refreſhing of them frequently will make them produce the greater number of pods.

The dwarf pea is preferred for this purpoſe, becauſe it is more eaſily confined within frames, than any other ſort. The reaſon for ſowing it in the common ground, and afterwards tranſplanting it into a hot-bed, is, to check its growth, and thereby make it bear the more in a ſmaller compaſs.

The hotſpur, of which the ſorts before enumerated differ very little from each other, except in the forwardneſs of their fruit, in which the golden and the Charlton are earlieſt, ſucceeds the hot bed crop of the dwarf pea. But it is neceſſary to obſerve here, that both theſe kinds of hotſpur peas are particularly apt to degenerate, and become later in their podding, if they are cultivated in the ſame ground for three or four years running: wherefore the beſt way is to change their ſeeds annually, and always to prefer ſuch as come from a colder ſituation and a poorer ſoil, than the place where they are to be ſown, for theſe will be earlieſt in the ſpring; and if they are procured from a diſtant part, it will be ſo much the better.

Theſe peas muſt alſo be ſown in warm borders, about a fortnight after the former, that is to ſay, towards the end of October. When the plants are a few inches high, they ſhould be earthed up as before directed, to defend their ſtems from froſt; and if the winter be very ſevere, they ſhould be covered with haulm, or ſome other light covering: but this muſt be taken off as ſoon as the weather grows mild, leſt it ſhould draw them up weak and tender; and the weeding and earthing up ſhould be repeated as they advance in growth, but with care not to bury their leaves, for that might rot their ſtems, eſpecially in wet ſeaſons. Both of theſe works muſt be very carefully performed in the ſpring: and this is likewiſe the moſt proper time to kill the ſlugs, which, of all vermin, do the greateſt injury to peas. They lie all day in the hollows of the earth, near the ſtems of the plants, and come out in the night, to the ſometimes total ruin of the crop. They abound moſt in wet ſoils, and in neglected grounds over-run with weeds: for which reaſon they have the leaſt chance of finding ſhelter where the new huſbandry is well practiſed. Mr. Miller recommends, as the beſt method he could ever find to deſtroy them, to clear the ground thoroughly well around the plants, and there, very early in a fine mild morning, when theſe inſects are got abroad, to ſlake a quantity of lime and ſtrew it over the ground hot, and pretty thick. This will kill the ſlugs wherever it falls upon them, and will not do much hurt to the peas, if they be not over-loaded with it.

If this crop does well, it will immediately ſucceed that of the dwarf peas on the hot-bed: but leſt it ſhould miſcarry, it will be right to ſow two other crops, at the diſtance of about a fortnight or three weeks from each other. Theſe will ſuffice till the ſpring, when more crops of the ſame ſort may be ſown every fortnight, and by this means the early peas will be continued through the ſeaſon.

About the middle of February, ſome of the Spaniſh morotto, which is a great bearer, and a hardy pea, may be ſown in a clear open ſpot of ground, for the next uſe of the family. The rows of theſe, which are a larger kind, ſhould be four feet aſunder, and the peas ſhould be dropped at about an inch from each other in the drills.

To ſucceed theſe, another ſpot of ground ſhould be ſown about the end of February, either with the ſame, or any other large ſort of pea, and theſe ſowings ſhould be continued every fortnight, till the middle or latter end of May; only obſerving to allow diſtances proportioned to the ſize of the pea at it's full growth. Thus marrowfats, for example, ſhould not ſtand nearer than four feet and an half from row to row, and the roſe pea ſhould be at leaſt eight or ten inches aſunder in the rows: for all peas, (and the caſe is exactly the ſame in regard to every other plant) will run up in height, and yield but little fruit, if they are too much crowded.

When theſe larger ſorts of peas (which muſt be carefully weeded and earthed up as before directed) are grown about eight or ten inches high, ſome bruſh-wood ſhould be ſtuck up cloſe to them, to prevent their trailing upon the ground, which is very apt to rot theſe kinds in particular, eſpecially in wet ſeaſons: and another great advantage ariſing from their being thus ſupported, is that the air has then a free current between them, which will keep their bloſſoms from falling off before their time, and they will conſequently bear much better than they could if left trailing upon the ground. There will alſo, by this means, be proper room to hoe between the rows, and to paſs between them in order to gather the peas when they are ripe.

The marrowfat is the beſt taſted of all the large kinds of peas, and it will continue good till the end of Auguſt, if it be planted in a ſtrong ſoil. The other large growing ſorts may be raiſed for the common uſe of the family, becauſe they yield the moſt plentifully, and can endure the greateſt drought: but the early kinds are by far the ſweeteſt. It will therefore be well worth the maſter's while to ſee that a crop of theſe, and particularly of the early hotſpur, is ſown every fortnight, to ſupply at leaſt his own table during the ſeaſon.

All the dwarf peas yield plentifully, if the weather be not over dry; but they ſeldom continue to bear long. As they rarely ſurpaſs the height of one foot, or ſpread wider than ſix inches, about two feet and an half may be a ſufficient ſpace for weeding and ſtirring of the ground between their rows, in which they need not be ſet above an inch aſunder. Among theſe may be claſſed the ſickle pea, or ſugar pea, which is much cultivated in ſeveral foreign countries, but is ſeldom propagated here, except by curious gentlemen, for their own table. The pods of this pea, are crooked and ill-ſhaped, but extremely ſweet when boiled with their unripe fruit in them, as is the general way of dreſſing them; for they have not any tough inſide ſkin, like the pods of other peas. I wonder that this ſort is not yet to be met with in our markets; unleſs the reaſon be, that the trading gardeners, who furniſh them, find that their profit will not pay for the trouble and expence of defending theſe peas from birds, which are ſo exceſſively fond of them, that they will ſoon devour a whole crop, if they are not very carefully kept off. If theſe peas are planted in April, they will be fit for gathering at Midſummer. Their pods, when they are very young, and their tendrils, have an agreeable acid flavour in ſallets; as have alſo the young tendrils of the hop and the vine.

A general rule to be obſerved in the planting of peas, is that the later they are ſown, the ſtronger and moiſter the ſoil ſhould be.

Having thus delivered the beſt method for cultivating peas in the kitchen-garden, we ſhall proceed to make ſuch obſervations as may be of uſe for obtaining large crops in the open field.

Mr. Liſle, for the greater eaſe and more certain guidance of country people, who are apt to be perplexed by a long liſt of particular names of different ſorts of field-peas, and of their ſeveral numerous varieties, judiciouſly ranges them under two general heads, viz. the tender and the hardy ſmall ſort, and the tender and the hardy great ſort; under the one or the other of which claſſes he thinks all kind of peas may properly he ranked, becauſe they equally agree or diſagree with the ſame ſoil. The tender pea, for example, is improper for a cold country, or, which amounts to the ſame, for cold ground in a warm country; and the large pea, by reaſon of its great haulm, is not proper for ſtrong rich land, becauſe its haulm will there increaſe to ſo great a length, that it will not be able to bear pods. His own experience in the year 1704, ſatisfied him fully that the beſt way to make peas pod well, is to ſow them on a mellow mould, rendered light by plowing: and he thinks it right to roll the ground ſoon after they are ſown.

Even the moſt general directions, and therefore theſe cannot but be of ſervice to the huſbandman: but more particular obſervations and actual experiments properly diverſified, are ſtill much wanted in the culture of this, and indeed of all other podded grains, and ſucculent plants, whoſe importance, as deſtroyers of weeds, improvers of land, and excellent preparers of it for other crops, is eſtabliſhed beyond diſpute. It is even a rule with farmers, not to ſow the ſame land a ſecond time with peas, till ſix, or at leaſt five years after the former crop of the ſame kind; becauſe, till then, the ground on which they grew will continue ſo rich as to make them run luxuriantly to haulm, in a manner inconſiſtent with the bearing of much fruit.

The common white pea does beſt on light ſandy land, or on a rich looſe ſoil. It is generally ſown with a broad caſt, and only harrowed in. Three buſhels of theſe peas are the uſual allowance of ſeed for an acre of ground; and the common time for ſowing them is about the latter end of March, or the beginning of April, on warm land: but a fortnight or three weeks later than this, will be early enough on cold ground. If ſown in drills, which is by far the beſt way, a buſhel and a half of ſeed will be full enough for an acre; and, when they are thus ſet regularly, the ground may be ſtirred with a hoe, to deſtroy the weeds, and earth up the plants, by which they will be greatly improved, and the peas will be much eaſier to cut in autumn, when they are ripe.

The green and the maple rouncivals require a ſtronger ſoil than the white, and ſhould be ſown a little later in the ſpring, alſo in drills, but farther aſunder, that is to ſay, at the diſtance of at leaſt two feet and a half, or three feet from each other, becauſe they are apt to grow rank, eſpecially in a wet ſeaſon. The ground between theſe rows ſhould be ſtirred two or three times with a hoe, which will not only deſtroy the weeds, but, by earthing up the peas, will greatly improve them, and alſo render the land fitter to receive whatever crop is put on it the following ſeaſon.

The gray and other large winter peas, as they are called, are ſeldom cultivated in gardens, becauſe they require a great deal of room. The beſt time for ſowing of theſe is about the beginning of March, when the weather is pretty dry; for if they are ſown in a very wet ſeaſon, they are apt to rot, eſpecially if the ground be cold. The diſtance between the rows ſhould here be at leaſt three feet, and theſe peas ſhould be ſown very thin in the rows: for if they are ſown too thick, their haulm will ſpread ſo as to fill the ground, and they will ramble over each other; by which means many of the plants will be rotted, and hindered from bearing. The common allowance of theſe large peas, is two buſhels to an acre: but that is certainly more than conſiſts with the very thin ſowing which is beſt for them.

The gray peas, in particular, thrive beſt on a ſtrong clayey land, in which they are commonly ſown under furrow. But by this method of ſowing, large peas, eſpecially, are always planted too thick, and at unequal depths, which prevent their coming up regularly. For this reaſon, among many others, all rank-growing plants, ſhould undoubtedly be ſown in drills, in which their ſeeds will be diſtributed much more equally in all reſpects.

If only a ſmall ſpot of ground be planted with theſe peaſe, a channel about two inches deep may be made with a hoe, guided by a line, the ſeeds may be dropped therein, and the earth may be drawn over them with a rake. By this means they will be covered equally, and with tolerable diſpatch, though not ſufficient for large fields, where, for this reaſon, a ſhallow furrow is commonly made with the plough, the ſeeds are ſcattered in it, and the earth is harrowed over them. The greateſt trouble then remaining is to keep the plants clear from weeds, and lay the earth up to their roots, which, in countries where labour is dear, is very expenſive to have done with the hand-hoe, but may be eaſily effected by drawing a horſe-hoe between the rows. This will entirely eradicate the weeds, ſtir the ſoil, render it mellow, and greatly promote the proper growth of the plants.

All ſorts of peaſe love limed or marled land: but when they are ſown late in the ſeaſon, the ſoil ſhould be ſtrong and moiſt; for they will then burn up and periſh in hot light land, or at leaſt not produce a crop worth taking off the ground. The authors of the *Maiſons Ruſtiques* approve of ſteeping them twenty-four hours in water before they are ſown, as well as to ſeparate the bad and faulty from the good, to enable theſe laſt to riſe the ſooner by being thus moiſtened. In general, the larger the pea is, and conſequently the later its uſual time of ripening, the earlier it ſhould be ſown, as experience has directed, and as Mr. Liſle rightly infers from the following curious obſervation, which, if duly attended to, may be of ſervice to huſbandmen and gardeners, and perhaps productive of ſome improvement in the culture of this plant.

In 1708, when the field and garden peaſe were near a foot high, he obſerved on the very top of them a purſe or neſt of buds of bloſſoms, lying in a bag together; and perceiving at the ſame time that there was no ſhew of bloſſoms putting forth at the lower joints, he concluded that the crops of peaſe would miſcarry that year, that they would

would not only have ſome top-kid, and that it would be vain to expect any on the lower joints, becauſe they are always forwarder in bloſſoming and kidding than the upper joints, and had not then the leaſt appearance of doing either. This afforded him ſome amuſements in reaſoning: but, not being ſatisfied, in a day or two after looked again into theſe upper pods or bags of bloſſoms, and, upon diſſecting a number of them, found ſometimes in a ſingle one near thirty bids of bloſſoms, two or three of which ſeemed uſually to have got the ſtart of the reſt, and to be bigger in bulk, and taller: moſt of the reſt ſeemed to lie in a huddle, without making any gradations: but as he had never ſeen, excepting the crown pea (which carries all its bloſſoms in a tuft at top, like a noſegay) other peaſe put forth above two bloſſoms and kids at top, which ſeldom come to any good, he ſuſpected that the many bloſſoms in this pod, muſt form the ſucceſſive gradations of bloſſoming joints, ariſing from that ſtock as from a common root, and that every bloſſom ſhot forth in order, as it grew forwarder than the reſt, while the main ſtem, advancing higher and higher, left behind the ſubaltern bloſſom of a lower joint. To be clear in this, he tied ſcarlet threads juſt under ſeveral of theſe pods, that he might know them again, and, as he expected, found in four or five days time a gradation of bloſſoms ariſing from joints with lobous leaves above his ſcarlet threads, and the pod of bloſſoms ſtill advanced on to the end, leaving behind farther joints of bloſſoms, till the whole ſtock was ſpent.

From this obſervation Mr. Liſle infers, 1. That by looking into this pod, or purſe of buds, while it is yet ſo much in its infancy as only to be viewed by a magnifying glaſs, we may judge what hopes there are of a future crop, provided the ſucceeding months prove favourable: and, 2. That we may learn from thence what ſort of peaſe to adapt to every ſort of ground: " but, continues he, before I enter on this part and uſe of the above-mentioned obſervation, I muſt, for the better underſtanding thereof, premiſe, that the farmers vary in their judgment in no one point ſo much as in the nature of the pea. Several ſorts of peaſe are commonly ſown within the limits of the ſame pariſh, and each of the perſons who ſow them generally has a great prejudice to any other ſort than that which he ſows, having perhaps been diſappointed of his expected return from other peaſe, when he has ſowed them, and being, for the ſame reaſon, equally diſpoſed as readily to alter his opinion of his laſt favourite kind; for the produce of a crop of peaſe is always very uncertain. But if the farmer would conſider, from the foregoing obſervation, how early or rath-ripe a pea is, or how late in ripening, in its nature; and that (as all its ſtock or power to put forth bloſſoms lies within the foliage of one pod) the art muſt reſult from thence, ſo to ſow the peaſe, in ſuch ground, and at ſuch time, that each ſort of pea, according to its nature, may, before autumn and cold weather come to check them, ſend forth all its gradations of joints or bloſſoms, ſo that none may become abortive for want of ſummer enough to enable nature to bring her embrios to maturity, and carry the bud-bloſſoms into kids; then it is apparent (as all large peaſe ripen late, and run to great haulm or ſtalks, and ſmall peaſe have leſs haulm and ripen earlier) that the great or late ripe peaſe ſhould be ſowed as early as the climate will permit; for thereby ſuch pea will get ſo forward as to have time to put forth all its gradations of bloſſoms and kids, and to perfect them before a rainy autumn comes, and puts a ſtop to farther vegetation. Again, great peaſe ought to be ſowed on a white, or ſome mixed land, not too groſs of juice; but not on a cold clay: for the moiſture of this laſt will keep feeding the haulm, and be inconſiſtent with the main deſign of ſowing them early, which is, that they may bring all their fruit to maturity in due time. The white or mixed mould muſt be in good heart; for otherwiſe it cannot maintain a great pea. On the other hand, it is evident from hence that a pea which ripens early ſhould be ſowed in a ſtrong feeding land, becauſe ſuch land will nouriſh it more vigorouſly, without danger of too great an increaſe of its haulm, which is naturally ſhort; and, notwithſtanding the coldneſs of the ſoil, there need be no doubt but that all the kids will ripen."

Moderate rains are of ſingular ſervice to peaſe while they grow, and particularly at their time of bloſſoming and filling up their pods; but a continuance of cold rain for many days, is perhaps as prejudicial as too much heat or drought. The blueiſh bloom upon their leaves, and their expending backward the two outermoſt and largeſt leaves of their bloſſoms, are undoubted ſigns of great health and vigour. Mr. Liſle is of opinion, that they neither ripen nor harden ſo well upon high grounds, as in the vallies, and conſequently that the former are not ſo fit for keeping as the latter.

Among the very few experiments on the culture of peaſe in field, the following, which M. Duhamel has given, afford a pretty ſtrong conviction of the benefits which ariſe from horſe-hoeing between their rows.

In April 1753, M. de Villiers, one of that ingenious gentleman's correſpondents, ſowed a ſmall field in Champagne, with peaſe, in double rows. Not being provided with a proper inſtrument to hoe the intermediate ſpaces, he made uſe of a narrow angular kind of ſhare, which ſtirred only three or four inches on the out ſide of the rows. Almoſt all the peaſe in his neighbourhood were deſtroyed that year by a kind of vermin called vine-fretters. His were hurt the leaſt of any; which was probably owing to the greater vigour of the plants, or the inſects being killed by the ſtirring of the ground. By a compariſon which he made of the produce of this ſpot, he found that it yielded ſix times as much as the ſame extent of the beſt land in the ſame country. " In a good year, ſays M. Duhamel, the difference would not have been ſo great; but ſtill this experiment ſhews that plants cultivated in the new or horſe-hoeing way, are better able to reſiſt the inclemencies of the ſeaſons, and other accidents, than thoſe which are cultivated according to the old method."

The next year, M. de Villiers, being provided with M. Duhamel's drill and horſe-hoe, ſowed peaſe again in rows, in ſome places two feet, and in others two feet and a half aſunder. But this diſtance was ſo narrow that it rendered the horſe-hoeing very difficult in many places, and quite impracticable in others. He was therefore obliged to contrive other means of ſtirring the ground, in which, notwithſtanding this, his peaſe flouriſhed extremely, and yielded more than any others on the very beſt land in the ſame diſtrict.

The ſame gentleman drilled peaſe again, in 1755, in a ſtrong heavy ſoil, in which no one had ever ventured to ſow any in the common huſbandry. They grew as high as if the ground had been ever ſo fit for them, and yielded half as much again as any ſown in the common way, beſides the ſaving in the ſeed, which in peaſe thus drilled, is about one half. They were ſown in double rows, with a ſpace about two feet and a half wide between the outmoſt rows of one range and the next outmoſt row of another, and this ſpace was ſtirred with the horſe-hoe.

When any particular ſorts of peaſe are intended for ſeed, they ſhould be carefully looked over whilſt in flower, in order to draw out all ſuch plants as are not of the right ſort; for there will always be, in every ſort, ſome roguiſh plants, as the gardeners term them, which, if left to mix, will degenerate the kind. As many rows as may be thought ſufficient to furniſh the deſired quantity of ſeed, ſhould then be marked out, and left till their pods turn brown and begin to ſpilt, when they ſhould immediately be gathered up, with the haulm; and if the huſbandman has not room to ſtack them till winter, they may be threſhed out as ſoon as they are dry, and put up in ſacks for uſe: but particular care ſhould be taken not to let theſe remain too long abroad after they are ripe, becauſe wet would rot them, and heat, after a ſhower of rain, would make their pods burſt in ſuch a manner that the greater part of their ſeeds would be loſt.

When peaſe are reaped, or hacked, as they call it in ſome parts of England, they are laid up in ſmall wads, and left in the field till their haulm and pods are dry: but during this time they ſhould be frequently turned, and raiſed as much as poſſible from the earth, that they may lie hollow for the wind to dry them, eſpecially when any rain happens to wet and beat them down. In Leiceſterſhire they ſet all their peaſe abroad in ſtacks, being perſuaded that they thence acquire a much better colour, than when houſed in a barn.

An ingenious farmer has obliged the public with the following method of preparing peaſe for hog-meat; and which we ſhall here give in his own words.

" A

"A few years ago, fays he, I had a plentiful crop of peafe on a ten acre piece, which lies near my houfe: when they were full podded and nearly ripe, I had them hooked in the ufual manner; but before I could get them in, there came a heavy fhower of rain, which wetted them through and through; and the dull heavy weather, with quent fhowers, which followed, prevented their drying for a confiderable time.

"I caufed the wads to be from time to time turned, to prevent the haulm from rotting; and at length a few days funfhine dried them enough to be inned; for as they lay hollow, the wind was greatly affiftant to the operation.

"Before I got them in, on examining fome of the pods, I found that the peafe were all fprouted to a confiderable length: this was what I had expected, as I gave my crop over for loft, till after a little recollection, as the weather ftill continued fine, I determined to threfh them in the field.

"This was accordingly done; and the corn, after it was caft and riddled to feparate it from the rubbifh, was dried on my malt-kiln.

"When this operation was over, I began to refleċt in what manner I fhould difpofe of my peafe, being fenfible that they could not be proper for feed, and ftanding no chance of difpofing of them to any advantage in the market.

"At length, as it was then a time of war, and of courfe there was a great demand for pork for the ufe of the navy, I determined to buy in a confiderable number of lean hogs, that I might by their means confume this crop on my own premifes, and in that manner make the moft of it.

"My expectations were more than anfwered, for I found, by repeated experience, that three bufhels of the peafe I have mentioned went nearly as far in fattening the hogs I bought, as four bufhels got in dry and hard in the manner ufually practifed.

"This difcovery I made feveral years ago, and it has turned out to my advantage; for, fince that time, I have been quite indifferent as to the weather in which my peafe are hooked, being rather better pleafed, as far as relates to them, with wet, than dry weather: but if the weather happens to be dry at the time they are ripe, I always caufe as many as I want for feeding my hogs, which are not a few in a year, to be regularly malted in the fame manner, nearly, as my barley: this management has, of late fucceeded very well with me, and I therefore intend to continue it.

"Befides feeding my hogs with thefe malted peafe, I have befides often given them to my horfes, with which they agree very well, and are heartening food.

"Turkeys will fatten apace on them alfo, and be fine meat.

"I have applied my malted peafe to many other ufes, which I have not, at prefent, time to enumerate: but were they only ufed for feeding hogs and horfes, it is ftill worth while to prepare fome in this manner every year." *Mufeum Rufticum, vol.* I. *page* 109.

PEASE-BOLT, peafe haulm.

PEAT, a fpecies of earth ufed in many countries for firing.

Under the article ASHES we have given fome account of the ufes of thofe made from peat; and fhall here add the obfervations of a very intelligent hufbandman, with regard to the value of thofe afhes, and the feveral crops to which they may be profitably employed as a manure.

"The more general, fays he, a manure is in its ufes, of fo much the more value is it to the farmer; and, of all forts of manures, perhaps afhes agree with the greateft variety of foils and crops: afhes, therefore, fhould, one would imagine, be had in univerfal requeft, for the purpofe of dreffing land; but the misfortune is, no great plenty can be procured, and the few that are to be got fetch a large price: this deters the farmer for making ufe of them often as manure.

"I muft, however, except one fort of afhes, which are on all accounts valuable; I mean peat or turf-afhes: thefe are, in moft places, eafy to be procured, coft no great matter, and have a wonderful effect on almoft every foil and crop. You may believe what I fay, as I have had many years experience of their good qualities.

"The fulphureous and faline particles with which thefe afhes abound, have a moft happy effect in promoting vegetation; and if ufed with difcretion, the increafe procured by them is truly wonderful.

"I fuppofe few of your readers will be at a lofs to know what peat or turf is, moft people having feen a kind of it burnt as fuel.

"The ordinary peat is dug from wet bogs and moraffes; but that which is of a much fuperior quality and virtue in its afhes, is dug from moory wettifh lands, which will bear cattle: as to the peat that is pared from the furface of heaths and commons, for firing for the poor cottagers, the afhes of it are of very little value, when compared with thofe above-mentioned.

"Peat is found in moft low grounds that lie betwixt hills, efpecially if timber has formerly ftood on the fpot. It lies at various depths, being often near the furface, and fometimes fix, eight, or ten feet deep, having a ftratum of black moory earth over it, fuch as is the foil of many of our low meadows near the banks of rivers: it fometimes even lies under a bed of gravel.

"Peat may be burnt, for the fake of procuring its afhes for manure, all the fummer feafon: as foon as it is dug, fome of it is mixed in a heap regularly difpofed with faggot wood, or other ready burning fuel: after a layer or two of it mixed in this manner, peat alone is piled up to complete the heap. A heap will confift of from one hundred to a thoufand loads.

"After fetting fire to it at a proper place, before on purpofe prepared, it is watched in the burning, and the great art is to keep in as much of the fmoke as poffible, provided that as much vent is left as will nourifh and feed the fire.

"Whenever a crack appears, out of which the fmoke efcapes, the labourer in that place lays on more peat; and if the fire flackens too much within, which may eafily be known by the heat on the outfide, the workman muft run a ftrong pole into the heap in as many places as is neceffary to fupply it with a quantity of frefh air. When managed in this manner, the work goes on as it fhould do. It is to be noticed, that when once the fire is well kindled, the heavieft rain does it no harm whilft it is burning.

"Having procured a fufficient quantity of afhes, the farmer's next care fhould be to apply them properly to ufe; and to do this, he muft be made well acquainted with the nature of the manure he is to lay on his land.

"All afhes are of a hot, fiery, cauftic nature; they muft therefore be ufed with caution. With refpect to peat-afhes, almoft the only danger proceeds from laying them on in too great quantities at improper feafons.

"Nothing can be better than peat-afhes for dreffing low damp meadows, laying to the quantity of from fifteen to twenty Winchefter bufhels on an acre: it is beft to fow them by hand, as they will then be more regularly fpread.

"This work fhould be done in January or February at lateft, that the afhes may be wafhed in towards the roots of the grafs by the firft rains that fall in the fpring.

"If they were fpread more forward in the year, and a fpeedy rain fhould not fucceed, being hot in their nature, they would be apt to burn up the grafs, inftead of doing it any fervice.

"It is to be remembered, that the damper and ftiffer the foil, the more peat-afhes fhould be laid on it; but in grafs lands the quantity fhould never exceed thirty Winchefter bufhels, and on light warm lands lefs than half that quantity is fully fufficient.

"On wheat crops thefe afhes are of the greateft fervice, but they muft be laid on with the utmoft difcretion. Were they to be fpread in any quantity before the winter, after the fowing the corn, they would make the wheat too rank, and do more harm than good; was the fpreading this manure, on the contrary, deferred till the fpring, the corn could not poffibly during the winter feafon be benefited by it. After due reflection and repeated experience, my method of management in this cafe is as follows:

"About the beginning of November, before the hard frofts fet in, I fow on every acre of my heavy clayey wheat land about eight Wincher bufhels of thefe afhes on my lighter

lighter warmer lands in wheat, I ſow only four buſhels at this ſeaſon.

" The winter-dreſſing is, I imagine, of great ſervice: trifling as the quantity may ſeem, it warms the roots of the plants, brings it moderately forward, preſerves its verdure, and diſpoſes it to get into a growing ſtate the firſt fine weather after Chriſtmas.

" About the latter end of February, or the beginning of March, on the above-mentioned heavy lands in wheat I beſtow another dreſſing of aſhes, by ſowing of them on every acre eight buſhels more: on my light lands, in this ſecond dreſſing, I allow only ſix buſhels.

" Theſe aſhes laid on in the ſpring are of the greateſt ſervice, without any probability of danger: if rain falls within a few days after the dreſſing is laid on, it is waſhed in, and has a happy effect on the ſucceeding crop, co-operating with the manure that was laid on in November: if, on the contrary, dry weather for a long continuance ſucceeds, the firſt winter-dreſſing has its full effect, and the quantity laid on in the ſpring is in fact ſo ſmall, that there is very little probability of its burning or hurting the crop.

" This method has ſucceeded very well with me, and I have no reaſon to think it can fail with any one elſe.

" This excellent manure is, I find, of great uſe in the turnep-huſbandry on many accounts, particularly as it much contributes to preſerve the young crop from being devoured by the fly.

" When I ſow my turneps, before I harrow in the ſeed, I have eight buſhels of theſe aſhes ſtrewed by hand on every acre, and when the plants ſhew their firſt leaves above ground, I ſow on every acre four buſhels more: by this management my crops ſeldom fail, when at the ſame time ſome of my neighbours ſow their turnep-land three or four times over.

" But one of the principal advantages derived from theſe aſhes I have not yet mentioned, which is the very great ſervice they are of to every kind of artificial paſture.

" Saintfoin receives great benefit from this manure, and ſo does clover, ray-graſs, and trefoil, provided it is laid on with diſcretion: the proper ſeaſon is about the month of February: the quantity muſt be regulated by the nature of the crop and ſoil; but, in my opinion, it ought ſcarcely in any inſtance to exceed thirty Wincheſter buſhels. Clover, with the help of this manure, grows with great luxuriance, inſomuch that I have often had two large crops of hay from the ſame field in a year, and good autumn feed afterwards.

" But the effect of it is moſt ſeen in tares or vetches, and on them it is I beſtow moſt of this manure, as they will bear it, being a very ſucculent plant. I had laſt ſummer a crop of tare-hay that was aſtoniſhing, by the help of theſe aſhes, being above three large loads on an acre. The field contained ſix acres; it was a dryiſh loam, and not very rich. In the beginning of February I cauſed ten buſhels, Wincheſter meaſure, to be ſtrewed on each acre: immediately after the firſt rains had waſhed them in, the ſame quantity was in like manner ſpread, and about the middle of March I beſtowed on each acre ſix buſhels more for the laſt dreſſing. I am fond of dividing my entire quantities, thinking my crops are thereby leſs expoſed to the danger of being burned, and the manure is beſides more gradual and laſting in its effects.

" My tares came on amazingly, but they run chiefly to haulm, which was what I wiſhed, not having any deſire of ſaving the ſeed, but intending to make the crop in hay: my only fear was, that it would rot on the ground before it was in a proper condition to cut; but this I luckily eſcaped, by the ſoil being tolerably dry, and by the fineneſs of the weather. It was ſo heavy in the ſwarth, that I was obliged to pay an extraordinary price for mowing it.

" I have obſerved above, that I was fearful my tares would have rotted on the ground before they were fit to cut; this was owing entirely to the invigorating quality of the aſhes, which by their ſalts, &c. promoted the growth of the plants even to luxuriance.

" Before I well knew the great fertilizing quality of theſe aſhes, I loſt, by improper management, a fine three acre piece of hog-peaſe. I laid on this field, ſoon after the peaſe came up, threeſcore Wincheſter buſhels of theſe aſhes at one dreſſing: this brought them forward a great pace, but at harveſt I found, to my grief, I had ſcarcely any corn, for I had overdone it in laying on ſo much, and the peaſe were run all to haulm.

" Ever ſince this accident I have declined uſing them as a common dreſſing for my peaſe; and this I have been the more induced to do, as, in ſeveral little experiments I have ſince made, I have found it extremely difficult to apportion the ſeveral quantities which ought to be laid on various ſoils when ſown with peaſe; for the quantity that has one year ſucceeded very well with me, has the next, owing to the difference of ſeaſons, on the ſame ſoil, in another part of the ſame field, totally diſappointed me; ſo that, for peaſe, I eſteem it a very critical manure, therefore very cautiouſly to be uſed.

" The effects of this manure will be viſible at leaſt three years, and it does not, like ſome others, leave the land in an impoveriſhed ſtate, when its virtues are exhauſted and ſpent.

" Peat-aſhes are not ſo certain a manure for barley and oats as for the winter-corn: for as theſe are quick growers, and occupy the land but a few months, this warm manure is often apt to puſh them forward too faſt, and make them run too much to coarſe ſtraw, yielding only a lean immature grain. Oats, however, are not ſo apt to be damaged by it as barley.

" To get a good crop of barley, I often ſow it after turneps, which have two light dreſſings of aſhes, in the manner above deſcribed.

" When the turneps are fed off, or drawn, I give the field, if the ſeaſon permits, a good ploughing: if they were fed off, the land will want no more aſhes; but if they were drawn, and either carried into another ground to feed ſheep, or given to my ſtall-fed oxen, I ſtrew on each acre, after this ploughing, five Wincheſter buſhels of aſhes, leaving them to be waſhed in by the firſt rain. In this manner I let the land lie till I give it the ſecond and laſt ploughing before it is ſown. The manure has by this management the deſired effect, and the barley generally produces full and heavy ears.

" When I ſow my barley after turneps, I give the land only two ploughings, becauſe the ſoil was before much looſened by the hoeings beſtowed on the turneps; but in other caſes I am fond of allowing three, and ſometimes four ploughings to my lands deſtined for barley; and I generally find it anſwer very well; for many years experience has convinced me, that upon a fine tilth barley always thrives beſt, and yields moſt: in fact, the crop is almoſt always governed by the condition of the land, and a well-tilled ſoil is leſs expoſed to danger in an untoward ſeaſon.

" Peat-aſhes approach, in their effects on the ſeveral crops on which they are laid, to coal-ſoot; but two-thirds of the quantity that is uſed of ſoot, will be ſufficient of the aſhes, as they are in a much ſtronger degree, impregnated with a vegetative power; and they are, beſides, in moſt places eaſier procured in quantities, and at a cheaper rate.

" It may poſſibly be objected, that this manure requires great nicety in the application: I allow it does; yet every intelligent farmer, who knows the nature and qualities of the ſoils of his ſeveral fields, will ſoon be able, with great preciſion, to judge how much he ought to lay on each acre: his chief care at firſt ſhould be not to overdo it; for therein conſiſts the principal danger; though, after all, theſe aſhes will, at the worſt, unleſs laid on in very great exceſs indeed, only occaſion the inexperienced farmer the perhaps partial loſs of a ſingle crop; for the ſucceeding year they will, in all probability, have a very ſalutary effect on the land, and ſometimes even repay the preceding loſs.

" When the error is in the exceſs, it is very eaſy for a farmer to avoid falling into it; for, independent of every other conſideration, the ſole view of leſſening his expences will, it is imagined, ſufficiently induce him to be attentive to this particular.

" When peat is burnt for the ſake of its aſhes in ſummer time, it is neceſſary that ſome care ſhould be taken to defend them from the too powerful influence of the ſun, air, dews, rains, &c. or great part of their virtue would be exhaled and exhauſted. If the quantity of aſhes procured is not very great, they may be eaſily put under cover in a barn, cart-lodge or hovel; but large quantities muſt neceſſarily, to avoid expence, be kept abroad; and when this is the caſe, they ſhould be ordered as follows.

" A dry ſpot of ground muſt be choſen; and on this the aſhes are to be laid in a large heap, as near as poſſible in the form of a cone ſtanding on its baſe, the top as ſharp pointed as poſſible: when this is done, let the whole be covered thinly over with a coat of ſoil, to defend the heap from the weather: the circumjacent earth, provided it is not too light and crumbly, will always ſerve for this purpoſe.

" When thus guarded, the heap may very ſafely be left till January or February, when it is in general the ſeaſon for ſpreading it: but, before it is uſed, it is always beſt to ſift the aſhes, that the cinders, ſtones, and half burnt turf, may be ſeparated from them.

" This may, perchance, by many be eſteemed an unneceſſary trouble; but experience, which is the beſt guide, has convinced me, that by this means I can better aſcertain the quantity that ought to be ſown on the ſeveral ſorts of land; for the ſmall powdered aſhes, being equal in quality, are of courſe equal in effect; whereas, when there has been any other mixture with them, the effect has often been greater or leſs than I could have wiſhed. Thus, when I mentioned the number of buſhels I ſtrew on an acre, it is always to be underſtood of ſifted aſhes: ſhould any farmer be inclined to try them rough as they are firſt produced after burning, the quantity to be allowed for an acre muſt be more in proportion to the mixture of other matter that is in them.

" Theſe peat-aſhes are almoſt, as I have already obſerved, a general manure ſuited to every ſoil. On cold clay they warm the too compact particles, diſpoſe it to ferment, crumble, and of courſe fertilize, and, in fine, not only aſſiſt it in diſcloſing and diſpenſing its great vegetative powers, but alſo bring to its aid a conſiderable proportion of ready prepared aliment for plants.

" On light lands theſe aſhes have a different effect: here the pores are too large to be affected, or farther ſeparated by the ſalts or ſulphur contained in them; but, being cloſely attached to the ſurfaces of the large particles, of which this earth is generally compoſed, this manure diſpoſes them, by means of its ſalts, to attract the moiſture contained in the air: by this operation, the plants which grow on theſe porous ſoils, are prevented from being ſcorched up and burnt; and if they want, which they generally do, more nouriſhment than the land is of itſelf capable of affording, this is readily and abundantly ſupplied by this uſeful manure.

" In large farms it is very uſual to ſee all the home-fields rich and well-mended by the yard-dung, &c. whereas the more diſtant lands are generally poor, impoveriſhed, and out of heart, for want of proper manure being applied in time.

" Whilſt the farmers depend almoſt entirely on their yard-dung, this cannot fail being the caſe; for dung is of very heavy carriage: they are willing, therefore, to drop it as near home as poſſible, being in this way able to do a great deal more work in the ſame ſpace of time: but would they once try the virtue of peat-aſhes, all their lands might be alike improved, though at a very conſiderable diſtance from the home-ſtall; for ſo few of them are required, and they are ſo light of carriage, that a ſingle tumbril will hold as many as ought, in moſt caſes, to be laid on two acres of land; by which means, when theſe aſhes are uſed as a dreſſing for the diſtant fields, it coſts the farmer leſs in carriage than does that of the ſtable-dung for his home-fields." *Muſeum Ruſticum, vol.* I. *page* 222.

PENNY-ROYAL, the name of an herb, that propagates itſelf very faſt by its numerous trailing branches, which faſten themſelves to the ground at every joint, and from thence put forth roots and new ſhoots. Nothing therefore is requiſite in order to its culture, but to cut off ſome of thoſe rooted branches, and to tranſplant them into other beds. This ſhould be done in September, that the young plants may have time to fix, and gather ſtrength before the winter comes on: for by this means they will yield a much larger crop the next ſummer, than they would do if removed in the ſpring. They ſhould be ſet, at leaſt, a foot aſunder every way, that they may have ſufficient room to grow in: for the roots of this plant multiply ſo exceedingly, that if planted at a ſmaller diſtance, they will meet together in the ſpace of a year, and afterwards ſoon rot one another in the winter.

Their favourite ſituation is moiſt, and ſomewhat ſhady; and if planted in ſuch places they will flouriſh amazingly. *Miller's Gard. Dict.*

PENNY-*earth*, a term uſed by the farmers for a hard, loamy, or ſandy earth, with a very large quantity of ſea ſhells intermixed in it; ſome of which being round and flat, and in ſome meaſure reſembling pieces of money, have occaſioned the earth's being called by this name. It is an earth not eaſily dug, but is uſually undermined with pickaxes, and then falls in large lumps; which, with the froſts, break to pieces, and leave the ſhells looſe. It is prepared by breaking and mixing well with water, and then makes very deſirable floors. The Jerſey combers comb-pots are alſo made of it, and the ſides and roofs of ovens are plaiſtered with it; and, being rightly managed, it combines into a flower almoſt as ſtrong as plaiſter of Paris. *Moreton's Northamptonſhire.*

PERRY, the name of a very pleaſant and wholeſome liquor extracted from pears, in the ſame manner as cyder is from apples. *See the article* CYDER.

The beſt pears for perry, or at leaſt the ſorts which have been hitherto deemed the fitteſt for making this liquor, are ſo exceſſively tart and harſh, that no mortal can think of eating them as fruit; for even hungry ſwine will not eat them, nay, hardly ſo much as ſmell to them. Of theſe the Boſbury pear, the Bareland pear, and the horſe pear, are the moſt eſteemed for perry in Worceſterſhire, and the ſquaſh pear, as it is called, in Glouceſterſhire; in both which counties, as well as in ſome of the adjacent parts, they are planted in the hedge-rows and moſt common fields.

There is this advantage attending pear trees, that they will thrive on land where apples will not ſo much as live, and that ſome of them grow to ſuch a ſize, that a ſingle pear tree, particularly of the Boſbury and the ſquaſh kind, has frequently been known to yield, in one ſeaſon, from one to four hogſheads of perry. The Boſbury pear is thought to yield the moſt laſting and moſt vinous liquor. The John pear, the Harpary pear, the Drake pear, the Mary pear, the Lullum pear, and ſeveral others of the harſheſt kinds, are eſteemed the beſt for perry, but the redder or more tawny they are, the more they are preferred. Pears, as well as apples, ſhould be full ripe before they are ground.

Dr. Beale, in his general advertiſements concerning cyder, ſubjoined to Mr. Evelyn's Pomona, diſapproves of Palladius's ſaying, that perry will keep during the winter, but that it turns four as ſoon as the weather begins to be warm; and gives, as his reaſons for being of a contrary opinion, that he had himſelf taſted at the end of ſummer, a very briſk, lively, and vinous liquor, made of horſe pears; that he had often tried the juice of the Boſbury pear, and found it both pleaſanter and richer the ſecond year, and ſtill more ſo the third, though kept only in common hogſheads, and in but indifferent cellars, without being bottled; and that a very honeſt, worthy, and ingenious gentleman in his neighbourhood aſſured him, as of his own experience, that it will keep a great while, and grow much the ſtonger for keeping, if put into a good cellar, and managed with due care. He imputes Palladius's error to his poſſibly ſpeaking of common eatable pears, and to the perry's having been made in a very hot country: but he would have aſcribed it to a more real cauſe, perhaps, had he pointed out the want of a thorough regular fermentation, to which it appears plainly that the ancients were entire ſtrangers; for all their vinous liquors were medicated by boiling, before they were laid up in order to be kept. *See the article* CYDER.

PHEASANT, a bird ſo nearly allied to our common poultry, that it would naturally appear a very eaſy thing to breed them up from young; but the proper food of them is not ſufficiently enquired into. Though they eat corn when full grown and in health, yet they have recourſe in their young ſtate, and when ſick, to another ſort of food, preying

preying on ſeveral inſects, and that in a very voracious manner.

The young pheaſants and partridges prey upon ants; and they will never ſucceed with us, if they have not a proper quantity of ants to have recourſe to, as ſoon as they leave their rooſt in a morning. When muſty corn, or want of due care in cleaning their houſes, has made them ſick, a repaſt of ants will often recover them. When that fails, they may be offered millepedes or earwigs, or both together, which will always do much better than either ſingly. To this medicine muſt be added a proper care that their common food of corn be very ſweet, their habitation kept nicely clean, and their water ſhifted twice a day. They muſt not be let out of the houſe in a morning till the dew is off the ground; and after ſun-ſet they muſt be immediately taken in again: in the heat of the day they muſt be allowed to baſk in the ſun in a dry ſandy place. With theſe regulations the birds of this kind will ſucceed much better than they uſually do. The pheaſant is a bird of a ſullen diſpoſition, and, when the coupling time is over, there are ſeldom found more than one in a place. *Philoſ. Tranſ.* Nº 23.

PIGEON, the name of a well known bird, and of which here are two kinds, the wild and the tame; the latter differ from the former only in bigneſs and familiarity: the wild uſually perch upon trees, being ſeldom ſeen on the ground. Pigeons are of various ſorts, ſuch as carriers, powters, runts, turbets, &c. *See* CARRIERS, &c.

There are two ſeaſons when you may eaſily procure a ſufficient ſtock of pigeons, viz. May and Auguſt: for at theſe ſeaſons there are a great number of young pigeons, which may then be purchaſed very reaſonably.

PIGEON HOUSE, a houſe erected full of holes within for the keeping, breeding, &c. of pigeons, otherwiſe called a dove-cote.

Any lord of a manor may build a pigeon-houſe on his land, but a tenant cannot do it without the lord's licence. When perſons ſhoot at or kill pigeons within a certain diſtance of the pigeon-houſe, they are liable to pay a forfeiture.

In order to erect a pigeon-houſe to advantage, it will be neceſſary, in the firſt place, to pitch upon a convenient ſituation, of which none is more proper than the middle of a ſpacious court-yard, becauſe pigeons are naturally of a timorous diſpoſition, and the leaſt noiſe they hear frightens them. With regard to the ſize of the pigeon-houſe, it muſt depend entirely upon the number of birds intended to be kept; but it is better to have it too large than too little; and as to its form, the round ſhould be preferred to the ſquare ones; becauſe rats cannot ſo eaſily come at them in the former as in the latter. It is alſo much more commodious; becauſe you may, by means of a ladder turning upon an axis, eaſily viſit all the neſts in the houſe, without the leaſt difficulty; which cannot ſo eaſily be done in a ſquare-houſe.

In order to hinder rats from climbing up the outſide of the pigeon-houſe, the wall ſhould be covered with tin plates to a certain height, about a foot and a half will be ſufficient; but they ſhould project out three or four inches at the top, to prevent their clambering any higher.

The pigeon-houſe ſhould be placed at no great diſtance from water, that the pigeons may carry it to their young ones; and their carrying it in their bills will warm it, and render it more wholeſome in cold weather.

The boards that cover the pigeon-houſe ſhould be well joined together, ſo that no rain may penetrate through it. And the whole building ſhould be covered with hard plaſter, and white-waſhed within and without, white being the moſt pleaſing colour to pigeons. There muſt be no window, or other opening, in the pigeon-houſe to the eaſtward; theſe ſhould always face the ſouth, for pigeons are very fond of the ſun, eſpecially in winter.

The neſts or covers in a pigeon-houſe, ſhould conſiſt of ſquare holds made in the walls of a ſize ſufficient to admit the cock and hen to ſtand in them. The firſt range of theſe neſts ſhould not be leſs than four feet from the ground, that the wall underneath being ſmooth, the rats may not be able to reach them. Theſe neſts ſhould be placed in quincunx order, and not directly over one another. Nor muſt they be continued any higher than within three feet of the top of the wall: and the upper row ſhould be covered with a board projecting a conſiderable diſtance from the wall, for fear the rats ſhould find means to climb the outſide of the houſe.

M. Duhamel thinks that pigeons neither feed upon the green corn, nor have bills ſtrong enough to ſearch for its ſeeds in the earth; but only pick up the grains that are not covered, which would infallibly become the prey of other animals, or be dried up by the ſun. "From the time of the ſprouting of the corn, ſays he, pigeons live chiefly upon the ſeeds of wild uncultivated plants, and therefore leſſen conſiderably the quantity of weeds that would otherwiſe ſpring up; as will appear from a juſt eſtimate of the quantity of grain neceſſary to feed all the pigeons of a well-ſtocked dove-houſe." But Mr. Worlidge and Mr. Liſle alledge facts in ſupport of the contrary opinion. The latter relates, that a farmer in his neighbourhood aſſured him he had known an acre ſowed with peas, and rain coming on ſo that they could not be harrowed in, every pea was fetched away in half a day's time by pigeons: and the former ſays, "It is to be obſerved, that where the flight of pigeons falls, there they fill themſelves and away, and return again where they firſt roſe, and ſo proceed over a whole piece of ground, if they like it. Although you cannot perceive any grain above the ground, they know how to find it. I have ſeen them lie ſo much upon a piece of about two or three acres ſown with peas, that they devoured at leaſt three parts in four of the ſeed, which, I am ſure, could not be all above the ſurface of the ground. That their ſmelling is their principal director, I have obſerved; having ſown a ſmall plat of peas in my garden, near a pigeon-houſe, and covered them ſo well that not a pea appeared above ground. In a few day, a parcel of pigeons were hard at work in diſcovering this hidden treaſure; and in a few days more I had not above two or three peas left out of about two quarts that were planted; for what they could not find before, they found when the buds appeared, notwithſtanding they were hoed in, and well covered. Their ſmelling alone directed them, as I ſuppoſed, becauſe they followed the ranges exactly. The injury they do at harveſt on the peas, vetches, &c. is ſuch that we may rank them among the greateſt enemies the poor huſbandman meets withal; and the greater, becauſe he may not erect a pigeon-houſe, whereby to have a ſhare of his own ſpoils; none but the rich being allowed this privilege, and ſo ſevere a law being alſo made to protect theſe winged thieves, that a man cannot encounter them, even in defence of his own property. You have therefore no remedy againſt them, but to affright them away by noiſes, or ſuch like. You may, indeed, ſhoot at them; but you muſt not kill them; or you may, if you can, take them in a net, cut off their tails, and let them go; by which means you will impound them: for when they are in their houſes, they cannot bolt or fly out of the tops of them, but by the ſtrength of their tails, after the thus weakening of which, they remain priſoners at home."

Mr. Worlidge's impounding the pigeons reminds me of a humourous ſtory of a gentleman who, upon a neighbouring farmer's complaining to him, that his pigeons were a great nuiſance to his land, and did ſad miſchief to his corn, replied jokingly, Pound them, if you catch them treſpaſſing. The farmer, improving the hint, ſteeped a parcel of peas in an infuſion of coculus indicus, or ſome other intoxicating drug, and ſtrewed them upon his grounds. The pigeons ſwallowed them, and ſoon remained motionleſs on the field: upon which the farmer threw a net over them, incloſed them in it, and carried them to an empty barn, from whence he ſent the gentleman word that he had followed his directions with regard to the pounding of his pigeons, and deſired him to come and releaſe them.

PIGGIN, a little pail or tub, with an erect handle.

PIKE, a name given in ſome counties to what is generally called a fork, uſed for carrying ſtraw, &c. from the barn, cocking of barley, &c.

PINE, the name of a foreſt tree, of which there are various ſpecies, but two only that deſerve cultivating; namely, the Scotch-pine, and the white pine, commonly called in England lord Weymouth's, or New England pine.

The

The Scotch-pine, ſo called from its growing naturally on the mountains of Scotland, is the tree that affords the red or yellow deal, which is the moſt durable of any of the kinds yet known. The leaves of this tree are pretty broad and ſhort, of a greyiſh colour, growing two out of each ſheath; the cones are ſmall, pyramidal, and end in narrow points; they are of a light colour, and the ſeeds are ſmall.

This ſort grows well upon almoſt every ſoil; I have planted numbers of the trees upon peat bogs, where they have made great progreſs. I have alſo planted them in clay, where they have ſucceeded far beyond expectation; and upon ſand, gravel, and chalk, they likewiſe thrive as well; but as they do not grow near ſo faſt upon gravel and ſand, as upon moiſt ground, ſo the wood is much preferable; for thoſe trees which have been cut down upon moiſt ſoils, where they have made the greateſt progreſs, when they have been ſawn out into boards, have not been valuable, the wood has been white, and of a looſe texture; whereas thoſe which have grown upon dry gravelly ground, have proved nearly equal to the beſt foreign deals; and I doubt not but thoſe plantations, which of late years have been made of theſe trees, will, in the next age, not only turn greatly to the advantage of their poſſeſſors, but alſo become a national benefit.

The white pine is one of the talleſt trees of all the ſpecies, often growing a hundred feet high, as I have been credibly informed. The bark of this tree is very ſmooth and delicate, eſpecially when young; the leaves are long and ſlender, five growing out of each ſheath; the branches are pretty cloſely garniſhed with them, ſo make a fine appearance; the cones are long, ſlender, and very looſe, opening with the firſt warmth of the ſpring: ſo that if they are not gathered in winter, the ſcales open and let out the ſeeds. The wood of this ſort is eſteemed for making of maſts for ſhips; it is in England called lord Weymouth's, or New England pine, as hath been already obſerved. As the wood of this tree was generally thought of great ſervice to the navy, there was a law made in the ninth year of queen Anne, for the preſervation of the trees, and to encourage their growth in America; and it is within forty years paſt theſe trees began to be propagated in England in any plenty, though there were ſome large trees of this ſort growing in two or three places long before, particularly at lord Weymouth's, at Longleet, Sir Wyndham Knatchbull's in Kent; and it has been chiefly from the ſeeds of the latter that the much greater number of theſe trees now in England have been raiſed; for although there has annually been ſome of the ſeeds brought from America, yet thoſe have been few in compariſon to the produce of the trees in Kent: many of the trees, which have been raiſed from the ſeeds of thoſe trees, now produce plenty of the ſeeds, particularly thoſe in the gardens of the late duke of Argyle at Whitton, which annually produce large quantities of cones, which his grace, when living, moſt generouſly diſtributed to all the curious.

All the ſorts of pines are propagated by ſeeds, which are produced in hard woody cones; the way to get the ſeeds out of theſe cones, which are cloſe, is to lay them before a gentle fire, which will cauſe the cells to open, and then the ſeeds may be eaſily taken out. If the cones are kept entire, the ſeeds will remain good ſome years, ſo that the ſureſt way to preſerve them, is to let them remain in the cones, until the time for ſowing the ſeeds: if the cones are kept in a warm place in ſummer, they will open, and emit the ſeeds; but if they are not expoſed too much to heat, many of the ſorts will remain entire ſome years, eſpecially thoſe which are cloſe and compact; and the ſeeds, which have been taken out of cones of ſeven years old, have grown very well, ſo that theſe may be tranſported to any diſtance, provided the cones are well ripened, and properly put up.

The beſt time for ſowing the ſeeds of pines, is about the end of March; when the ſeeds are ſown, the place ſhould be covered with nets to keep off birds, otherwiſe, when the plants begin to appear with the huſk of the ſeed on their tops, the birds will pick off the heads of the plants, and deſtroy them.

Where the quantity of ſeeds to be ſown is not great, it will be a good way to ſow them either in boxes or pots filled with light loamy earth, which may be removed from one ſituation to another, according to the ſeaſon of the year; but if there is a large quantity of the ſeeds, ſo as to require a good ſpace to receive them, they ſhould be ſown on an eaſt or north-eaſt border, where they may be ſcreened from the ſun, whoſe heat is very injurious to theſe plants at their firſt appearance above ground. Thoſe ſeeds, which are ſown in pots or boxes, ſhould alſo be placed in a ſhady ſituation, but not under trees; and if they are ſcreened from the ſun with mats, at the time when the plants firſt come up, it will be a good method to preſerve them.

When the plants appear, they muſt be conſtantly kept clean from weeds, and, in very dry ſeaſons, if they are now and then gently refreſhed with water, it will forward their growth; but this muſt be done with great care and caution, for if they are haſtily watered, it will waſh the tender plants out of the ground, or lay them down flat, which often rots their ſhanks; and when this is too often repeated, it will have the ſame effect; ſo that unleſs it is judiciouſly performed, it will be the beſt way to give them none, but only ſcreen them from the ſun.

If the plants come up too cloſe, it will be a good method to thin them gently about the beginning of July. The plants, which are drawn up, may then be planted on other beds, which ſhould be prepared ready to receive them, for they ſhould be immediately planted as they are drawn up, becauſe their tender roots are ſoon dried and ſpoiled at this ſeaſon of the year. This work ſhould be done, if poſſible, in cloudy or rainy weather, and then the plants will draw out with better roots, and will ſoon put out new fibres again; but if the weather ſhould prove clear and dry, the plants ſhould be ſhaded every day from the ſun with mats, and now and then gently refreſhed with water. In drawing up of the plants, there ſhould be great care taken not to diſturb the roots of the plants left remaining in the ſeed-beds, &c. ſo that if the ground be hard, the beds ſhould be well watered ſome time before the plants are thinned, to ſoften and looſen the earth; and if, after the plants are drawn out, the beds are again gently watered to ſettle the earth to the roots of the remaining plants, it will be of great ſervice to them; but it muſt be done with great care, ſo as not to waſh out their roots, or lay down the plants. The diſtance, which ſhould be allowed theſe plants, is four ur five inches row from row, and three inches in the rows.

In theſe beds the plants may remain till the ſpring twelve-months after, by which time they will be fit to tranſplant where they are to remain for good; for the younger plants are, when planted out, the better they will ſucceed; for although ſome ſorts will bear tranſplanting at a much greater age, yet young plants planted at the ſame time will in a few years overtake the large ones, and ſoon outſtrip them in their growth; and there is an advantage in planting young, by ſaving the expence of ſtaking, and much watering, which large plants require. I have ſeveral times ſeen plantations of ſeveral ſorts of pines, which were made of plants ſix or ſeven feet high, and at the ſame time others of one foot high planted between them, which in ten years were better trees than the old ones, and much more vigorous in their growth; but if the ground, where they are deſigned to remain, cannot be prepared by the time before mentioned, the plants ſhould be planted out of the beds into a nurſery, where they may remain two years, but not longer; for it will be very hazardous in removing theſe trees at a greater age.

The beſt ſeaſon to tranſplant theſe pines, is about the latter end of March, or the beginning of April, juſt before they begin to ſhoot; for although the Scotch pine, and ſome of the moſt hardy ſorts, may be tranſplanted in winter, eſpecially when they are growing in ſtrong land, where they may be taken up with balls of earth to their roots, yet this is what I would not adviſe for common practice, having frequently ſeen it attended with bad conſequences; but thoſe which are removed in the ſpring rarely fail.

Where theſe trees are planted in expoſed ſituations, they ſhould be put pretty cloſe together, that they may ſhelter each other, and, when they have grown a few years, part of the plants may be cut down to give room

for

for the others to grow; but this muſt be gradually performed, leſt by too much opening the plantation at once, the air ſhould be let in among the remaining trees with too great violence, which will ſtop their growth.

Wherever large plantations are deſigned to be made, the beſt method will be to raiſe the plants either upon a part of the ſame land, or as near to the place as poſſible, and alſo upon the ſame ſort of ſoil; a ſmall piece of ground will be ſufficient to raiſe plants enough for many acres; but, as the plants require ſome care in their firſt raiſing, if the neighbouring cottagers, who have many of them ſmall incloſures adjoining to their cottages; or, where this is wanting, a ſmall incloſure ſhould be made them for the purpoſe of raiſing the plants, and they be furniſhed with the ſeeds and directions for ſowing them, and managing the young plants, till they are fit for tranſplanting, the women and children may be uſefully employed in this work, and the proprietors of land agreeing with them to take their plants, when raiſed, at a certain price, it would be a great benefit to the poor, and hereby they would be engaged to have a regard for the plantations when made, and prevent their being deſtroyed.

The Scotch pine, as was before obſerved, being the hardieſt of all the kinds, and the wood of it the moſt uſeful, is the ſort which beſt deſerves care. This will thrive upon the moſt barren ſands, where ſcarce any thing elſe except heath and furze will grow; ſo that there are many thouſand acres of ſuch land lying convenient for water carriage, which at preſent is of little benefit to any body, that might, by plantations of theſe trees, become good eſtates to their proprietors, and alſo a national benefit; and as the legiſlators have taken this into their conſideration, and already paſſed ſome laws for the encouraging theſe plantations, as alſo for their preſervation and ſecurity; ſo it may be hoped that this will be undertaken by the gentlemen who are poſſeſſed of ſuch lands in all the different parts of the kingdom, with proper ſpirit; for although they may not expect to receive much profit from theſe plantations in their own time, yet their ſucceſſors may with large intereſt, and the pleaſure which theſe growing trees will afford them, by beautifying the preſent dreary parts of the country, will in ſome meaſure recompenſe them for their trouble and expence, and by creating employment for the poor, leſſen thoſe rates which are now, in many parts of England, ſcarce to be borne.

The expence of making theſe plantations is what moſt people are afraid of, ſo would not engage in it; but the greateſt of the expence is that of fencing them from the cattle, &c. for the other is trifling, as there will be no neceſſity for preparing the ground to receive the plants, and the charge of planting an acre of land with theſe plants will not be more than thirty ſhillings where labour is dear, excluſive of the plants, which may be valued at forty ſhillings more. I have planted many acres of land with theſe trees, which was covered with heath and furze, and have only dug holes between to put in the plants, and afterward laid the heath or furze, which was cut upon the ſurface of the ground about their roots, to prevent the ground drying, and few of the plants have failed. Theſe plants were moſt of them four years old from ſeed, nor was there any care taken to clean the ground afterward, but the whole left to ſhift, and in five or ſix years the pines have grown ſo well, as to over-power the heath and furze, and deſtroy it.

The diſtance which I have generally planted theſe plants in all large open ſituations, was about four feet, but always irregular, avoiding planting in rows as much as poſſible; and in the planting, the great care is not to take up the plants faſter than they can be planted, ſo that ſome men have been employed in digging up of the plants, while others were planting. Thoſe who take up the plants, muſt be looked after to ſee they do not tear off their roots, or wound their bark; and as faſt as they are taken up, their roots ſhould be covered to prevent their drying, and put into their new quarters as ſoon as poſſible. In planting them, care ſhould be had to make the holes large enough for their roots, as alſo to looſen and break the clods of earth, and put the fineſt immediately about their roots, then to ſettle the earth gently with the foot to the roots of the plant. If theſe things are duly obſerved, and a proper ſeaſon choſen for performing it, there will be very little hazard of their ſucceeding; but I have ſeen ſome plantations made with plants, which were brought from a great diſtance, and had been ſo cloſely packed up, as to cauſe a heat, whereby moſt of the plants within had their leaves changed yellow, and few of them have grown, which has diſcouraged others from planting, not knowing the true cauſe of their failure.

After the plantations are made, the only care they require for five or ſix years, will be to ſecure the plants from cattle, hares, and rabbits; for if theſe are admitted to them, they will make great deſtruction in a ſhort time, for if the branches are gnawed by hares or rabbits, it will greatly retard the growth of the plants, if not deſtroy them.

In about five or ſix years after planting, the branches of the young trees will have met, and begin to interfere with each other, therefore they will require a little pruning; but this muſt be done with great caution. The lower tier of branches only ſhould be cut off; this ſhould be performed in September, at which time there will be no danger of the wounds bleeding too much, and the turpentine will harden over the wounds as the ſeaſon grows cold, ſo will prevent the wet from penetrating of them. Theſe branches ſhould be cut off cloſe to the ſtem of the plants, and care ſhould be taken in the doing of this, not to break any of the remaining branches of the young trees. This work ſhould be repeated every other year, at each time taking off only the lower tier of branches; for if the plants are much trimmed, it will greatly retard their growth, as it does in general that of all trees; but as theſe trees never put out any new ſhoots where they are pruned, ſo they ſuffer more from amputation than thoſe which do.

In about twelve or fourteen years theſe will require no more pruning, for their upper branches will kill thoſe below where they have not air; but ſoon after this, if the plants have made good progreſs, it may be neceſſary to thin them; but this ſhould be gradually performed, beginning in the middle of the plantation firſt, leaving the outſide cloſe to ſcreen thoſe within from the cold, ſo by degrees coming to them at laſt, whereby thoſe, which were firſt thinned, will have had time to get ſtrength, ſo will not be in danger of ſuffering from the admiſſion of cold air. When theſe plantations are thinned, the trees ſhould not be dug up; but their ſtems cut off cloſe to the ground, for their roots never ſhoot again, but decay in the earth, ſo there can no harm ariſe by leaving them, and hereby the roots of the remaining plants are not injured. The trees which are now cut, will be fit for many purpoſes; thoſe which are ſtrait, will make good putlocks for the bricklayers, and ſerve for ſcaffolding poles, ſo that there may be as much made by the ſale of theſe, as will defray the whole expence of the planting, and probably intereſt for the money into the bargain.

As the upright growth of theſe trees renders their wood the more valuable, they ſhould be left pretty cloſe together, whereby they will draw each other up, and grow very tall. I have ſeen ſome of theſe trees growing, whoſe naked ſtems have been more than ſeventy feet high, and as ſtraight as a walking cane, and from one of theſe trees there were as many boards ſawed, as laid the floor of a room near twenty feet ſquare. If theſe trees are left eight feet aſunder each way, it will be ſufficient room for their growth; therefore, if at the firſt thinning a fourth part of the trees are taken away, the other may ſtand twelve or fourteen years longer, by which time they will be of a ſize for making ladders, and ſtandards for ſcaffolding, and many other purpoſes; ſo that from this ſale, as much may be made, as to not only pay the remaining part of the expence of planting, if any ſhould be wanting in the firſt, but rent for the land with intereſt, and the ſtanding trees for fortunes of younger children. This may be demonſtrated by figures, and there has been ſeveral examples of late years, where the profits have greatly exceeded what is here mentioned. *Miller's Gard. Dict.*

Pitch, tar, reſin, and turpentine, are all made from theſe trees by a very familiar proceſs. In the ſpring time, when the ſap is moſt free in running, they pare off the bark of the pine-tree, to make the ſap run down into

a hole

a hole which they cut at the bottom to receive it: in the way, as it runs down, it leaves a white matter like cream, but a little thicker: this is very different from all the kinds of refin and turpentine in ufe, and it is generally fold to be ufed in the making of flambeaux, inftead of white bees wax. The matter that is received in the hole at the bottom, is taken up with ladles, and put in a large bafket; a great part of this immediately runs through, and this is the common turpentine. This is received into ftone or earthen pots, and is ready for fale. The thicker matter, which remains in the bafket, they put into a common alembic, adding a lage quantity of water; they diftil this as long as any oil is feen fwimming upon the water; this oil they feparate from the furface in large quantities, and this is the common oil or fpirit of turpentine; the remaining matter, at the bottom of the ftill, is common yellow refin. When they have thus obtained all that they can from the fap of the tree, they cut it down, and, hewing the wood into billets, they fill a pit dug in the earth with thefe billets, and, fetting them on fire, there runs from them, while they are burning, a black thick matter; this naturally falls to the bottom of the pit, and this is the tar. The top of the pit is covered with tiles, to keep in the heat; and there is at the bottom a little hole, out at which the tar runs like oil: if this hole be made too large, it fets the whole quantity of the tar on fire; but, if fmall enough, it runs quietly out.

The tar, being thus made, is put up in barrels, and, if it be to be made into pitch, they put it into large boiling veffels, without adding any thing to it: it is then fuffered to boil a while, and, being then let out, is found, when cold, to be what we call pitch. *Phil. Tranf.* Numb. 243.

PINE-APPLE, the name of a very curious plant, of which Tournefort has enumerated three, and Mr. Miller fix, fpecies.

The pine-apple, fo called from its refembling the cones of the European pine-tree, is a native of the torrid zone; but has for fome years been cultivated here in tolerable perfection. The plant that produces it nearly refembles the aloe, except that the leaves of the pine-apple are much thinner, longer, and moft of them near the ground ftand in a horizontal pofition; but as they approach nearer the fruit, diminifh in length, and become lefs expanded. The plant, in its native climate, feldom grows to above three feet in height, and terminates in a flower refembling a lilly, but of fo elegant a crimfon as to dazzle the eye. The pine-apple makes its firft appearance in the center of the flower, about the fize of a nut; and as this increafes, the luftre of the flower fades, and the leaves expand themfelves to make room for it, and ferve it at once for a bafe and ornament. On the top of the apple itfelf is a crown or tuft of leaves, like thofe of the plant, and of a very lively blue-green colour. This crown grows in proportion with the fruit, till both have attained their utmoft magnitude. As foon as this happens the fruit begins to ripen, and its green changes into a bright ftraw-colour; during this alteration of colour, the fruit exhales fuch a fragrancy as to difcover it, though concealed from fight. While it continues to grow, it fhoots out, on all fides, little thorns or prickles, which, as it approaches towards maturity, dry and foften, fo that the fruit is gathered without the leaft inconvenience.

The fingularities that concenter in this product of nature cannot fail of ftriking a contemplative mind with admiration. The crown which formed a kind of apex, while growing, becomes itfelf a new plant; and the ftem, after the fruit is cut, dies away, as if fatisfied with having anfwered the intention of nature in fuch a production; but the roots fhoot forth frefh ftalks, or fuckers, for the farther increafe of fo váluable a fpecies.

Thefe plants are propagated by planting the crowns which grow on the fruit, or the fuckers which are produced either from the plants, or under the fruit, either of which I have found to be equally good; although, by fome perfons, the crown is thought preferable to the fuckers, as fuppofing it will produce fruit fooner than the fuckers, which is certainly a miftake; for by conftant experience I find the fuckers (if equally ftrong) will fruit as foon, and produce as large fruit as the crowns.

The fuckers and crowns muft be laid to dry in a warm place for four or five days, or more (according to the moifture of the part which adhered to the old plant or fruit) for, if they are immediately planted, they will rot. The certain rule of judging when they are fit to plant, is by obferving if the bottom is healed over, and become hard; for, if the fuckers are drawn off carefully from the old plants, they will have a hard fkin over the lower part; fo need not lie fo long as thofe which by accident may have been broken. But whenever a crown is taken from the fruit, or the fuckers from the old plants, they fhould be immediately divefted of their bottom leaves, fo high as to allow depth for their planting; fo that they may be thoroughly dry and healed in every part, left, when they receive heat and moifture, they fhould perifh, which often happens when this method is not purfued. If thefe fuckers or crowns are taken off late in the autumn, or during the winter, or early in the fpring, they fhould be laid in a dry place in the ftove, for a fortnight or three weeks before they are planted; but in the fummer-feafon they will be fit for planting in three or four days.

As to the earth in which thefe fhould be planted, if you have a rich good kitchen-garden mould, not too heavy, fo as to detain the moifture too long, nor over light and fandy, it will be very proper for them without any mixture: but, where this is wanting, you fhould procure fome frefh earth from a good pafture, which fhould be mixed with about a third part of rotten neats-dung, or the dung of an old melon or cucumber-bed, which is well confumed. Thefe fhould be mixed fix or eight months at leaft before they are ufed; but if it be a year, it will be the better; and fhould be often turned, that their parts may be the better united, as alfo the clods well broken. This earth fhould not be fcreened very fine; for, if you only clear it of the great ftones, it will be better for the plants than when it is made too fine. You fhould always avoid mixing any fand with the earth, unlefs it be extremely ftiff; and then it will be neceffary to have it mixed at leaft fix months or a year before it is ufed; and it muft be frequently turned, that the fand may be incorporated in the earth, fo as to divide its parts: but you fhould not put more than a fixth part of fand; for too much fand is very injurious to thefe plants.

In the fummer feafon, when the weather is warm, thefe plants muft be frequently watered; but you fhould not give them large quantities at a time. You muft alfo be very careful that the moifture is not detained in the pots by the holes being ftopped; for that will foon deftroy the plants. If the feafon is warm, they fhould be watered every other day; but, in a cool feafon, twice a weak will be often enough: and, during the fummer feafon, you fhould once a weak water them gently all over their leaves, which will wafh the filth off them, and thereby greatly promote the growth of the plants. There are fome perfons who frequently fhift thefe plants from pot to pot; but this is by no means to be practifed by thofe who propofe to have large well-flavoured fruit; for, unlefs the pots be filled with the roots, by the time the plants begin to fhew their fruit, they commonly produce fmall fruit, which have generally large crowns on them; fo that the plants will not require to be new potted oftener than twice in a feafon; the firft time fhould be about the end of April, when the fuckers and crowns of the former year's fruit (which remained all the winter in thofe pots in which they were firft planted) fhould be fhifted into larger pots, i. e. thofe which were in half-penny or three farthings pots, fhould be put into penny, or at moft three halfpenny pots, according to the fize of the plants; for you muft be very careful not to over-pot them, nothing being more prejudicial to thefe plants. The fecond time for fhifting them is towards the latter end of Auguft, or the beginning of September, when you fhould fhift thefe plants which are of a proper fize for fruiting the following fpring into two-penny pots, which are full large enough for any of thofe plants. At each of thefe times of fhifting the plants, the bark-bed fhould be ftirred up, and fome new bark added, to raife the bed up to the height it was at firft made; and, when the pots are plunged again into the bark-bed, the plants ſhould be watered gently all over the leaves, to waſh off the filth, and to ſettle the earth to the roots of the plants. If the bark-bed be well ſtirred, and a quantity of good freſh bark added to the bed, at this latter ſhifting, it will be of great ſervice to the plants; and they may remain in the tan until the beginning of November, or ſometimes later, according to the mildneſs of the ſeaſon, and will not require any fire before that time. During the winter ſeaſon theſe plants will not require to be watered oftener than every third or fourth day, according as you find the earth in the pots to dry: nor ſhould you give them too much at a time; for it is much better to give them a little water often, than to over-water them, eſpecially at that ſeaſon. You muſt obſerve never to ſhift thoſe plants which ſhew their fruit into other pots; for, if they are removed after the fruit appears, it will ſtop the growth, and thereby cauſe the fruit to be ſmaller, and retard its ripening; ſo that many times it will be October or November before the fruit is ripe: therefore you ſhould be very careful to keep the plants in a vigorous growing ſtate from the firſt appearance of the fruit, becauſe upon this depends the goodneſs and ſize of the fruit; for, if they receive a check after this, the fruit is generally ſmall and ill-taſted.

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

The following Method of cultivating the pine-apple Plants, was communicated by the late Mr. Allen, of Bath; and has been practiſed with great Succeſs:

Let the pine-apple plants be planted as ſoon as poſſible, in pots of about eight or nine inches diameter, and plunged into a bed of tanner's bark, about three foot and a half thick; and let the laſt half foot on the top of the bed be old tan that has loſt its heat, which will prevent the plants being ſcorched at the roots. In September ſhift them into large pots with all the earth about them: at the ſame time ſhaking up the tan to the bottom of the pit, adding ſome freſh to keep it up to its proper height; ſtill obſerving to keep about ſix inches of old tan at the top. This will be ſufficient to keep them till they ſhew their fruit, which will probably be in February or March; when being prepared with a bed of freſh tan, cover it over about two inches thick with earth; then turn the plants out of the pots, without diſturbing the roots, and place them on the bed at proper diſtances, filling up the interſtices with good earth; where they may remain till the fruit is ripe: water them about twice a week all over the bed, but not on the fruit.

There may be few objections raiſed againſt this method, the principal of which is, That thoſe plants which do not ſhew when they are turned out of the pots, there is a great probability of their paſſing the ſummer without fruiting; or, if there ſhould be any that ripen late, the houſe cannot be at liberty to receive the plants for the ſucceeding year; and if it is all new tan, as propoſed, it is apt to cake and want freſh ſtirring when the fruit is three parts grown, in order to ſwell the fruit out to a large ſize.

There are two ſorts of the ananas principally cultivated in England; one called the queen-pine, the other the Montſerrat. The queen is moſt eſteemed among the gardeners, as being more regular and certain in their bearing; whereas the Montſerrat ſort frequently miſs the proper ſeaſon; and many that are brought from that iſland, though fine plants to look at, are apt to produce but trifling fruit. One cauſe of this, perhaps, may be, the ill choice that is made in promiſcuouſly taking the ſuckers from the plants that have produced but indifferent fruit.

It generally happens that pine plants which are brought from the Weſt-Indies, have a white inſect adhering to them, and which, if not deſtroyed, may infect a whole houſe of plants to their great prejudice, as they never thrive while theſe inſects prey on them. Some gardeners infuſe the plants in tobacco water, in order to deſtroy theſe inſects, but this often rots the plants: a much better method therefore is, when the plants arrive, to ſtrip the ſmall leaves from the roots, and clean them dry; for it is in that part theſe inſects moſtly harbour. While the bottoms of the plants are hardening, make a hot-bed with dung, and lay ſeven or eight inches of old tan on it, which cover with glaſſes. When the violence of the heat is a little abated, ſtick the plants in the tan, and let them remain there about three weeks; by which time they will be fit for potting, and the inſects intirely deſtroyed by the ſteam of the dung. As for plants that do not immediately come from abroad, they are never troubled with theſe inſects, unleſs the waterings have been neglected, or the plants by ſome other means are become unhealthy; for they will not prey upon any perfectly healthful plant.

The following Eſtimate of the Expence of building a Stove for raiſing Pine-apples; together with the annual Charges for Tan, Labour, &c. appeared in the Muſeum Ruſticum, *Vol. III. Pag.* 142.

A ſtove, forty feet long, and twelve wide, is the proper ſize for one fire-place, and contains as much air as one fire will properly warm: I ſhall therefore calculate my expences for one of that ſize, and particularly as it will produce about one hundred and fifty pines a year, which is fruit enough for a moderate-ſized family.

The height in front is three feet, and the back part about ſeven feet.

The front, one end, and roof to be of glaſs, the other end brick, where ſhould be a room about twelve feet ſquare, and it ought not to be leſs, for the convenience of laying the fuel, and for making the fire.

As to the dimenſions of the flues, &c. it is not neceſſary here to inſert them; but I will beg leave to refer any gentleman, who wants to build one, to that ingenious bricklayer, Mr. Salter Field, of Walton upon Thames, who has ſhewed great ſkill and judgment in building ſeveral.

The expence of building ſuch a ſtove will be about eighty pounds, ſuppoſing all the materials to be new, and at the prices given in London and its neighbourhood; but if you have the conveniency of a wall ready built to erect it againſt, it will ſave about fifteen pounds.

The price of the plants will be according to their ſizes, from two or three ſhillings each to ten or twelve, and entirely depends on how long you will wait for fruit, and whether you will buy ſuch as will produce fruit of only one pound weight each, or two or three pounds; but about fifty pounds will ſtock it properly at firſt, to have fruit immediately.

The yearly Expences as follows.

	l.	s.	d.
Eight hundred buſhels of tan to fill the pit at firſt, at three half-pence per buſhel	5	0	0
Sixteen loads carriage	0	16	0
Three chaldrons and a half of coals, at thirty-ſix ſhillings per chaldron	6	6	0
Two hundred buſhels of tan more, to keep the bed level with its former height, at three half-pence per buſhel	1	5	0
Four loads carriage	0	4	0
Filling the pit with tan, and planting the pots, two days, two men, at two ſhillings a day each	0	8	0
Stirring the tan up, and adding freſh four times more, at ditto	1	12	0
The time in attending the fires, watering, &c. is worth at the moſt eighteen-pence a week, which comes to	3	18	0
Repairing the windows, painting, and white-waſhing	1	11	0
Total	21	0	0

The

The ashes from your house, and rubbish from your garden, or, where you can get peat or turf cheap, will abate something in coals; and I think there are few places in England where all the articles together will cost so much: thus you will have one hundred and fifty pines of one pound and a half weight each, one with another, for less than three shillings a-piece; and with good management most of them will weigh two or three pounds a-piece, especially if you plant only your prime crowns and suckers.

Besides pines, you may have vines come through the walls, and nailed to the roofs, and on the flues French-beans, strawberries, and cucumbers.

PIP, *or* PEP, a disease among poultry, consisting of a white thin skin, or film, which growing under the tip of the tongue, hinders their feeding. It usually arises from their drinking puddle-water, or eating filthy meat; and is cured by pulling off the film with the fingers, and rubbing the tongue with salt.

PLEURISY, and inflammation of the lungs, &c. are disorders in horses, though they have scarce been mentioned by any writer in farriery before Mr. Gibson; who, by frequently examining the carcases of dead horses has found them subject to the different kinds of inflammations here described.

He has often discovered matter on the pleura (or membrane which lines the chest internally) making its way into the chest; he has found in some horses the whole substance of the lungs black, and full of a gangrened water; and in others abscesses of various sizes; and in short, inflammations in every bowel. He has frequently seen the blood vessels so over-loaded, that the blood has burst out of the smaller vessels, and run over their carcasses in many places, while the collar-maker was fleaing off their hides, and on cutting open the larger vessels, the blood has gushed out as from a fountain, filling all the cavity of the body; an evident proof, that plentiful evacuations had been neglected. In order to distinguish these disorders from others, we shall describe the symptoms in Mr. Gibson's own words.

"A pleurisy then, which is an inflammation of the pleura; and a peripneumony, which is an inflammation of the lungs; have symptoms very much alike; with this difference only, that in a pleurisy a horse shews great uneasiness, and shifts about from place to place; the fever, which at first is moderate, rises suddenly very high; in the beginning he often strives to lie down, but starts up again immediately, and frequently turns his head towards the affected side, which has caused many to mistake a pleuritic disorder for the gripes, this sign being common to both, though with this difference:

"In the gripes a horse frequently lies down, and rolls, and when they are violent, he will also have convulsive twitches, his eyes being turned up, and his limbs stretched out, as if he was dying; his ears and feet sometimes occasionally hot, and sometimes as cold as ice; he falls into profuse sweats, and then into cold damps, strives often to stale and dung, but with great pain and difficulty; which symptoms generally continue, till he has some relief: but in a pleurisy, a horse's ears and feet are always burning-hot, his mouth parched and dry, his pulse hard and quick; even sometimes when he is nigh dying, his fever is continued and increasing; and though in the beginning he makes many motions to lie down, yet afterwards he reins back as far as his collar will permit, and makes not the least offer to change his posture, but stands panting with short stops, and a disposition to cough, till he has relief, or drops down.

"In an inflammation of the lungs, several of the symptoms are the same, only in the beginning he is less active, and never offers to lie down during the whole time of his sickness; his fever is strong, breathing difficult, and attended with a short cough; and whereas in a pleurisy, a horse's mouth is generally parched and dry, in an inflammation of the lungs, when a horse's mouth is open, a roapy slime will run out in abundance; he gleets also at the nose a reddish or yellowish water, which sticks like glue to the inside of his nostrils.

"In a pleurisy, a horse heaves and works violently at his flanks, with great restlessness, and for the most part his belly is tucked up; but in an inflammation of the lungs, he always shews fullness, and the working of his flanks is regular, except after drinking and shifting his posture; and his ears and feet are for the most part cold, and often in damp sweats.

"The cure of both these disorders is the same. In the beginning a strong horse may lose three quarts of blood, the next day two quarts more; and if symptoms do not abate, the bleedings must be repeated, a quart at a time; for it is speedy, large, and quick repeated bleedings that are in these cases chiefly to be depended on. But if a horse has had any previous weakness, or is old, you must bleed him in less quantities, and oftener. Mr. Gibson recommends rowels, on each side the breast, and one on the belly; and a blistering ointment to be rubbed all over his brisket upon the foremost ribs.

"The diet and medicines should be both cooling, attenuating, relaxing, and diluting; and the horse should have warm mashes, and plenty of water or gruel. The following balls may be given thrice a day.

> "Take of spermaceti and nitre, of each one ounce; oil of anniseed thirty drops; honey enough to make a ball.

"A pint of barley-water, in which figs and liquorice-root have been boiled, should be given after each ball; to which the juice of lemons may be added; and if the lungs are greatly oppressed with a dry short cough, two or three horns full of the decoction may be given three or four times a day, with four spoonfuls of honey and linseed oil. A strong decoction of the rattle-snake root is also much recommended in pleuritic disorders, and may be given to the quantity of two quarts a day, sweetened with honey. It remarkably attenuates the blood, and disperses the inflammation, and in some parts is deemed a specific for this complaint.

"An emollient clyster should be injected once a day, to which may be added two ounces of nitre, or cream of tartar.

"In two or three days he will probably run at the nose, and begin to feed; but should he not, and continue hot and short breathed, you must bleed him again, and give the following clyster:

> "Take senna and marshmallows, of each two ounces; fennel and bay-berries, each one ounce: boil in five pints of water to two quarts, pour off the clear, and add four ounces of purging salts, two or three of syrup of buckthorn, and half a pint of linseed, or any common oil.

"If by these means he grows cooler, and his pain moderates, repeat the clyster the next day, unless it worked too much; then intermit a day; and when he comes to eat scalded bran and picked hay, leave off the balls, and continue only the decoction, with now and then a clyster.

"But let it be observed, that a horse seldom gets the better of these disorders, unless he has relief in a few days; for if the inflammation is not checked in that time, it usually terminates in a gangrene, or collection of matter, which for want of expectoration, soon suffocates him.

"But as pleuritic disorders are apt to leave a taint on the lungs, great care should be taken of the horse's exercise and feeding, which should be light and open for two or three weeks. Thus a quartern of bran scalded, with a spoonful of honey and flour of brimstone, may be given every day, with two or three small feeds of oats, sprinkled with chamber-lye. Instead of the bran, for a change, give about a quart of barley scalded in a double infusion of hot water, that it may be softened, and the water given to drink. His exercise should be gradual, in an open air and fair weather; and when his strength is recovered, a gentle purge or two should be given; that of rhubarb, when it can be afforded, is best, or the purging drink already recommended for this purpose.

"There is also an external pleurisy, or inflammation of the muscles between the ribs, which when not properly treated, proves the foundation of that disorder, called the chest-founder; for if the inflammation is not dispersed in time, and the viscid blood and juices so attenuated by internal medicines, that a free circulation is obtained; such a stiffness and inactivity will remain on these

these parts, as will not easily be removed, and which is generally known by the name of chest-founder.

"The signs of this inflammation, or external pleurisy, are a stiffness of the body, shoulders, and fore-legs; attended sometimes with a short dry cough, and a shrinking when handled in those parts.

"Bleeding, soft pectorals, attenuants, and gentle purges are the internal remedies; and externally the parts affected may be bathed with equal parts of spirit of sal armoniac, and ointment of marshmallows, or oil of chamomile.

"These outward inflammations frequently fall into the inside of the fore-leg, and sometimes near the shoulder; forming abscesses, which terminate the disorder.

"The membrane which separates the lungs, and more particularly the diaphragm, or midriff, is often also inflamed; which is scarce to be distinguished from the pleurisy, only in this, that when the midriff is greatly inflamed, the horse will sometimes be jaw-set, and his mouth so much closed, that nothing can be got in: but the method of cure is the same." *Bartlet's Farriery, page* 51.

PLOUGH, a well known machine for breaking up the ground.

The advantage of digging with the spade, or such other instrument, very naturally led men to the invention of the plough, a greatly more expeditious way of doing the same thing; that is, cutting and breaking the earth into small pieces; but in this the spade has the advantage of the common plough, as it goes deeper, and divides the earth more minutely; but the improvement of the common plough into the four-coultered one, shews that it is easy to make the plough perform this office as much better, as it usually does it worse than the spade.

The plough described by Virgil had no coulter; and at this time, the ploughs of Italy and the south of France, have none; and the ploughs in Greece, and in the eastern nations in general, are of the same kind. Neither is it indeed possible to use a coulter in such a plough; because the share does not cut the bottom of the furrow horizontally, but obliquely: in going one way it turns off the furrow to the right-hand, but in coming back it turns it off to the left; therefore if it had a coulter, it must be on the wrong side every other furrow.

It is a great mistake in those who say that Virgil's plough had two earth-boards, for it had really none at all; but the share itself always going obliquely, served instead of an earth-board; and two ears, which were the corners of a piece of wood lying under the shares, did the office of ground-wrists. This fashion of the plough continues to this day in those countries; and in Languedoc this sort of plough performs tolerably well when the ground is fine, and makes a shift to break up light land. This is the sort of land that is common in the east, and the arable lands about Rome, being never suffered to be fallow so long as to come to turf: this plough succeeds very well in such places, but it would be wholly impossible to turn up what in England we call strong land, with it.

The English ploughs are therefore different from these, as the soil is different. Our ploughs, where well made, cut off the furrow at the bottom horizontally; and therefore, it being as thick on the land side as on the furrow side, the ploughs cannot break it off from the whole land at such a thickness, being six times greater than what the eastern ploughs have to break off, and for this purpose it must have, of necessity, a coulter to cut it off: by this means the furrow is turned perfectly whole, and no part of the turf of it is broken; and if it lie long without new turning, the grass from the edges will spread, and form a new turf on the other side, which was the bottom of the furrow before the turning; but is now become the surface of the earth, and will soon become greener with grass than it was before ploughing.

If whole, strong, turfy furrows are ploughed cross ways, as is too commonly practised, the coulter cannot easily cut them; because, being loose underneath, they do not make a proper resistance or pressure against its edge, but are apt to be drawn on heaps, and turned in all directions, but without cutting.

Some of our ploughs have heavy drags, with long iron tines in them; and though these broken pieces of furrows, being now looser than before, require keener edges to cut them, these tines have no edges at all. Thus the clods of earth are tossed into heaps again, and the surface left bare between them, and great labour and expence is used to very little purpose: all this is owing to the one coulter.

If the soil be shallow, it may be broken up with a narrow furrow, which will the sooner be brought into tilth; but if it be a deep soil, the furrows must be proportionably enlarged, or else a great part of the good mould will be left unmoved, and so be lost. The deeper the land is, the worse it is broke by one coulter; that is, it is broke into larger furrows, and it requires such repeated labour to conquer this, that, often, the best land will scarcely pay the tillage.

This gives an opportunity to servants to cheat their masters. They plough such deep land with a small furrow, and shallow, to the end, that the turf and furrows may be broken the sooner, and the superficial part made fine. They pretend the plough will go deeper the next time; but this is never the case.

This sort of land must not be ploughed the second time in wet weather; for this will cause the weeds to multiply, and the earth will be formed into thick and heavy clods where trodden: and in dry weather, the resistance of the untouched earth below, and the slight pressure of the plough above, will always be reasons why the plough will enter no deeper the second time than it did the first.

Another way to conquer a strong turf, is to plough it up first with a breast plough, very thin; and when the sward is rotten, then it is to be ploughed to the proper depth: but this method is liable to great objections; it is very troublesome and expensive, and if the turf be pared off in the winter, or early in spring, it is a chance but the rains come on, and set it to growing faster than before: if, on the other hand, it be pared later in the year, though the turf be thoroughly killed by the succeeding dry weather, yet the time is lost, and the farmer loses the sowing season for wheat, which is the proper corn for such strong land.

Paring PLOUGH, an instrument used in several parts of England, for paring off the surface of the ground, in order to its being burnt. *See the article* BURN-BAKING.

One of the best and simplest instruments of this kind is that which Mr. Bradley gives, with the following description.

From A to A, Fig. 1. Plate XXI. is the plough-beam, about seven feet long, mortised and pinioned into the block B, which is of clean timber, without knots. CC are the sheaths or standards, made flat on the inside, to close equally with the paring-plate, and be fastened to it with a bolt and key on each side, as is marked at D.

E is the paring-plate, of iron laid with steel, about four inches wide, and from twelve to eighteen inches long, as the business may require. This plate must be made to cut on the sides, which are bolted to the standards, as well as at the bottom part.

FF are two iron braces, to keep the standards from giving way. These standards must be mortised near their outsides, and through the block.

GG are the plough handles, which must be fixed slopewise between the beam and the standards.

The pin-holes in the beam, the use of which is to make this plough cut more or less deep, by fixing the wheels nearer to or farther from the paring-plate, should not be above two inches asunder.

Rotherham, or *Patent* PLOUGH, the name of a plough, very simple in its construction, easily worked, and therefore deserves the husbandman's particular attention.

Fig. 2. Plate XXI. represents the left or land side of this plough, of which AB is the beam, CD the sheath, EBD the main handle, FR, the smaller handle, GH the coulter, KI the sock or share, NP the bridle, S the fly-band, ML a piece of wood in place of a head. The forms of all these different parts, as they appear on this side of the plough, are here represented, and their sizes and distances may be measured by the annexed scale of feet and inches.

Fig. 3. represents the right-hand side of this plough, with all the parts that can be seen on that side, in which TV is the mould-board, &c.

Fig. 4. shews the under part of this plough turned up, in which may be seen the shape and size of the share, and the

the manner in which it is fixed on the ſheath, mould-board, and ground-reſt, with the angle which they make.

Fig. 5. repreſents the hind-part of the plough, in which are ſeen the two handles EF, with the hinder-part of the mould-board VT, and a piece of wood in the place of the head LM, in their proper ſhapes and ſizes by the ſcale.

Fig. 6. repreſents an upper view of this plough, as it appears while it works, with the bridle NP extended, the mould-board TV, fixed in its proper poſition, and all the other parts as they appear in this ſituation, in their ſeveral ſhapes and ſizes according to the ſcale.

Fig. 7. is the upper part of the ſock or ſhare.

Fig. 8. ſhews the opening of the ſhare, as it is fixed on the end of the ſheath and mould-board.

Fig. 9. is a perſpective view of the bridle.

The whole of this plough ſhould be made of aſh or elm; the irons ſhould be ſteeled and well tempered; and that part of the plough which is under ground in tilling, ſhould be covered with plates of iron.

The difference betwixt this and the common ploughs, ſeems to conſiſt in the bridle at the end of the beam, by which the ploughman can give the plough more or leſs land by the notches at N in Fig. 4, and 6. or make it cut deeper or ſhallower by the holes at P in Fig. 2, and 3. in the coulter and ſhare, which are made and ſet ſo as to cut off the new furrow without tearing; and in the mould-board, which is ſo ſhaped at firſt to raiſe a little, and then gradually turn over the new cut furrow with very little reſiſtance. But the greateſt advantage of all is, its being ſo eaſy of draught, that it will do double the work of any common plough, as experience has proved; and, with only one man and two horſes, will perform, even in ſtiff land, as much as two men and ſix horſes can do in a moderately light ſoil with any of the wheeled ploughs generally uſed, or indeed known in this country, where their great defect is, that they are too complex, and weigh too much upon the fore-carriage, ſo that the friction of their wheels becomes a conſiderable addition to the draught: for the beſt plough certainly is that which is the moſt ſimple in its make and tackle; which requires the leaſt ſtrength to draw it, in proportion to the ſtiffneſs of the ſoil; which can be made always to cut to a proper depth; and which, by the ſhape of its mould-board, is beſt adapted to turn the furrow upſide down. The principle of the Kentiſh plough, with the ſhifting mould-board, is very good, where the land is dry, and will admit of it.

Meſſieurs de Chateauvieux and Duhamel, ever ſtudious to promote the welfare of mankind, have endeavoured to remedy theſe inconveniencies in wheeled ploughs, by the following improvements, which, with their uſual ſpirit of univerſal benevolence, they have moſt obligingly communicated to the world. We ſhall begin with the invention of the former of theſe gentlemen, becauſe it was rather prior, in point of time, to that of M. Duhamel.

The fore-part of M. de Chateauvieux's plough is compoſed of a wheel thirty-two inches in diameter, which may be extended to thirty-four inches, or reduced to thirty: but to fall ſhort of, or to exceed theſe meaſures, would be attended with inconveniencies. This wheel may be made very light, eſpecially if it be encircled with a thin hoop of iron. The plough itſelf is repreſented in Plate XXII. Fig. 1, 2, and 3. where Fig. 2. is the plan, and Fig. 1. the profile.

The frame in which the wheel is placed, is formed by two ſhafts AB, CD, Fig. 2. diſtant from each other eighteen inches, from inſide to inſide; which fixes the length of the nave of the wheel. Theſe ſhafts are four feet eight inches long, and may be reduced to four feet four inches, by ſhortening them at the ends C and A. They are about two inches and a quarter ſquare: but the edges ſhould be rounded off. Theſe two pieces are faſtened together by the two croſs ſtaves EF, GH, which are two inches and a half wide, and about an inch thick. They are riveted to one of the ſhafts, at E and G, where they are not to be looſened at all; and at their other ends F and H, the ſhaft muſt be moveable, ſo as to be taken off, to let the two croſs ſtaves through two mortiſes in the beam IK of the plough; after which the ſhaft CD is put in its place, and fixed with two iron pins, *a*, *b*. Between the two ſhafts is placed the wheel LM, the nave of which is pierced through its center, with a hole proportioned to the thickneſs of the iron pin or ſpindle NO, which ſerves for an axle-tree, and is repreſented by the two pricked lines. This ſpindle, or axle-tree, the diameter of which is about three quarters of an inch, ought not to project beyond the outſide of the ſhafts, leſt it ſhould lay hold of or hurt the ſtalks of the corn, when this plough is uſed for ſtirring the earth between the rows in the New Huſbandry, as will hereafter be more particularly mentioned. To fix it at N, that end is flattened, and bent over the ſhaft to the middle of its upper ſide, where it is faſtened at *d*, by a ſmall pin driven through it and the ſhaft.

On the upper ſurface of each of the ſhafts, at the ends A and C, are the hooks AC, to which the harneſs is faſtened: and at the other ends B and D, are two rings, the uſe of which will be explained hereafter.

The ſhafts AB, CD, ſhould be pierced with four or five holes, to ſet the wheel more or leſs forward or backward, in order to make the plough ſtrike more or leſs deep into the earth, as may be ſeen in Fig. 1. at *a*, *b*, *c*, and *d*. The ſame holes are indicated by the pricked lines on the two ſhafts of Fig. 2. from A to N, and from C to O.

The hind part of this plough conſiſts of the beam IK, Fig. 1, and 2. the ground-reſt CD, Fig. 1. which is covered by the ſhare LD; the handles KP, KQ, Fig. 2. and KP, Fig. 1. the ſheat EF, Fig. 1. of which part is pricked in Fig. 1. and the end appears at X in Fig. 2. the mould-board RS, Fig. 2. part of which is ſeen at N in Fig. 1. the coulter GH, Fig. 1. and TV, Fig. 2. and the ſhare LD, Fig. 1. part of which is ſeen at Y, in Fig. 2.

The beam is four feet eight inches long, excluſive of the tenon which traverſes the handles. Three inches and a quarter ſquare are very ſufficient in its thickeſt part, which is from X to V, Fig. 2. The mortiſes in the beam, which are under *g*, *h*, and through which the two croſs-ſtaves EF, GH, are ſlipt, ſhould be ſo fitted, that the croſs-ſtaves may not ſhake or be looſe in them, at the ſame time that the beam ſhould, by their help, ſlip with eaſe over the croſs-ſtaves, either to the right towards EG, or to the left towards FH, according as the intended ploughing may require. The beam ſhould be faſtened, either by two nuts ſcrewed on at *m*, *n*, which will fix it tight to the croſs-ſtaves EF, GH; or by two iron pins ſtuck through the holes *p* and *q* in the two croſs-ſtaves, one to the right in the croſs ſtaff EF, and the other to the left in the croſs-ſtaff GH. Theſe pins will keep the beam ſteady in its place.

The lower part of the ground-reſt ſhould be ſomewhat concave, as is repreſented at CD, Fig. 4. in order to leſſen its friction againſt the earth.

The beam IK, Fig. 1, and the ground-reſt CD, are faſtened together by the ſheat FE, and the handles PK, both of which laſt are riveted to the ground-reſt by two ſtrong iron pins, the heads of which are ſeen at *g* and *h*; and to the beam, as alſo to the tenon of the beam which traverſes the handles at *m*, *n*; and by the two wedges, *p*, *o*, and *q*, another uſe of which will be explained hereafter.

Wood naturally crooked is beſt to make the handles of, that they may be all of one piece, which ſhould be ſo diſpoſed, that one third of the ſpace between the two handles, ſhould be left on the left ſide, and the two other thirds on the right ſide, in order to facilitate the plowman's walking in the furrow. This diſpoſition is ſhewed in Fig. 2. in which a line *e*, *f*, drawn from the middle of the beam, between the two handles, gives to the left ſide a third P*f*, of the diſtance PQ between the two handles, and the two other thirds *f*Q to the other ſide.

For want of wood naturally bent to a proper ſhape, theſe handles may be made of two pieces firmly riveted and faſtened together; and if it ſhould be more convenient to the plowman, the whole ſpace between the handles may be on the right-ſide, as in Fig. 6.

The ſheat EF, Fig. 1, ſhould be very ſtrongly and cloſely faſtened by its tenon to the ground-reſt, at *g*. An intelligent

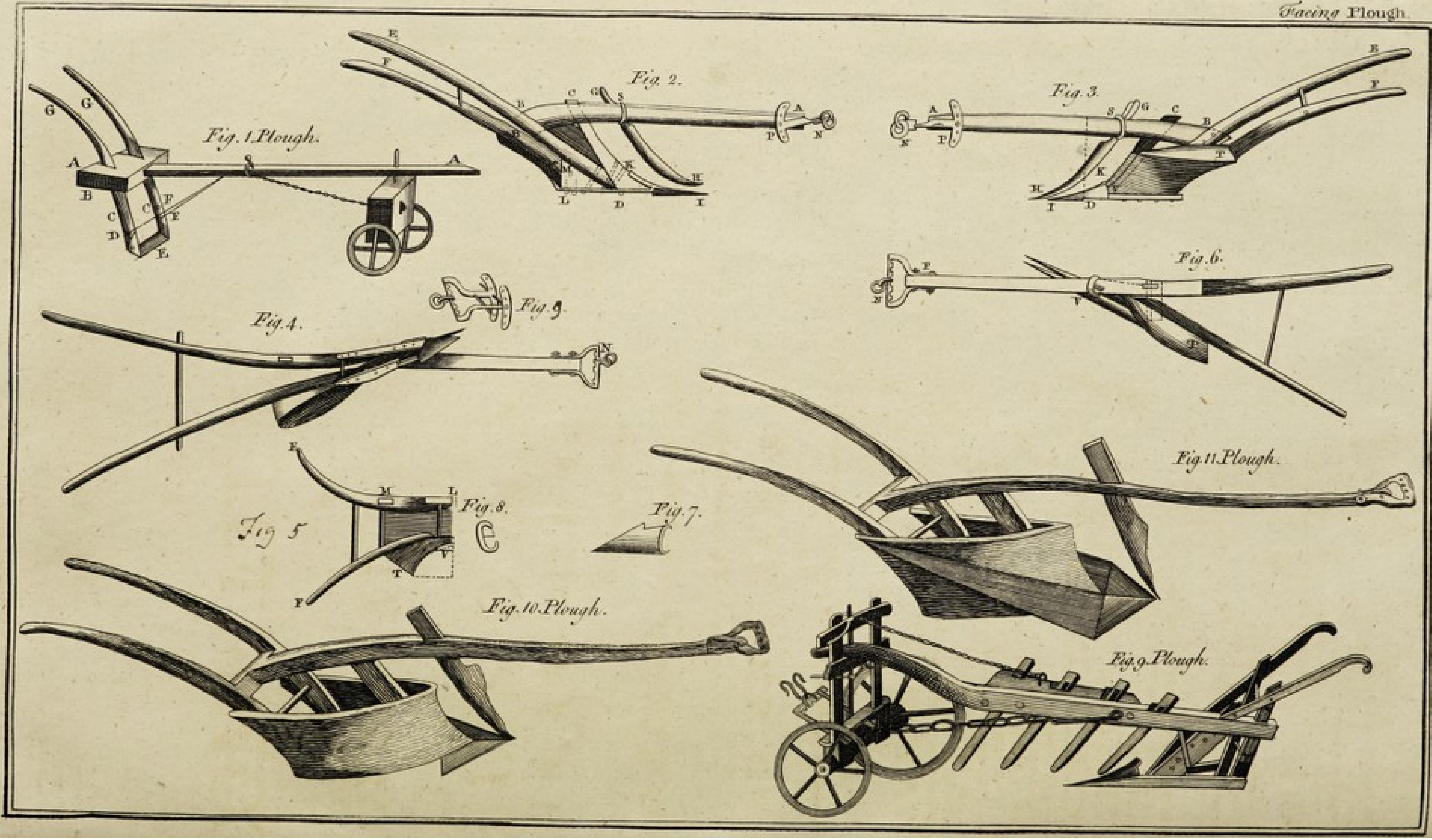


Fig. 1. Plough.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9
Fig. 9. Plough.
Fig. 10. Plough.
Fig. 11. Plough.

intelligent workman will eafily make it of a proper fize, which is about two inches and a half wide, and a full inch thick. The inclining of this piece with the ground-reft, gives it greater ftrength to refift, than if it was faftened to it at right angles.

The mould-board, reprefented by RS, Fig. 2, and AB, Fig. 7, is from thirty to thirty-one inches long, and ten inches high or deep. It ought to be placed as in Fig. 8, where its end A forms an acute angle, terminating at the junction of the fin of the fhare: its other end B extends beyond the length of the ground-reft, againft which it fhould incline, in fuch manner that, fuppofing the ground-reft to be lengthened out as far as C, the line CB would be twelve or thirteen inches long, reckoning from the fartheft lateral furface of the ground-reft to the fartheft lateral furface of the mould-board, which, being thus placed, will form the width of a furrow.

The lower part of this mould-board is floped a little inward, as is expreffed by the fhade in Fig. 7: and the part *b* Fig. 7, fhould jet out at leaft two inches beyond the part *a*. To this end, the mould-board fhould be made of a plank about three inches thick, which will bear being fcooped on one fide and rounded off on the other, in order to give it the concavity without, and the convexity within, reprefented in Fig. 3. and 7.

The mould-board fhould be well faftened, to prevent its being difplaced by the refiftance of the earth. The upright piece CD Fig. 7, which joins to the handles at its end D, and to the mould-board at its other end C, fupports it ftrongly. It is highly neceffary to cover the part of the mould-board which bears upon the earth, with a thin plate of iron, in order to preferve it; for otherwife it would foon be worn out.

The coulter GH, Fig. 1. fhould be made of good iron well fteeled. A notch is cut in the beam to receive it, as in Fig. 9 and 10; and as the corners of that notch, C and B, againft which the coulter bears hardeft when the plough works, would foon be worn away if the wood was left bare, it is proper to fecure them with two fmall pieces of iron AB, CD, about the fixth part of an inch in thicknefs, fcrewed on with flat-headed fcrews. Thefe pieces of iron will keep the coulter fteady in its place.

The coulter fhould be pierced with feveral holes from E to F, Fig. 10, to take it higher up, or let it lower down, as occafion may require. It is faftened to the beam, which is pierced at E, Fig. 9, by a ftrong iron pin with a fquare flat head, which is let into the beam and lies even with it, as in Fig. 10. The other end of this pin, E, Fig. 10, is a fcrew, fitted with its nut, by which the coulter is faftened tight to the beam. Upon this fcrew hangs the handle A, Fig. 1, which ferves to turn it, and at the end of which is the key that faftens on the nuts of the iron pins which fecure the fhare. By this means, the key to turn the fcrews is always carried with the plough.

M. de Chateauvieux's coulters weigh but five or fix pounds a-piece at moft, and frequently not more than three pounds.

He places his coulter fo that its point G, Fig. 1. projects about an inch beyond the outfide of the fhare LC.

Fig. 12 reprefents the fhape of the fhare, with its dimenfions, as do alfo Fig. 13 and 14. The point of this fhould be made of good fteel, and the reft of good iron, neither too foft, nor too high tempered, that it may not be fubject to break or bend. The tail of the fhare, AB, Fig. 12, fhould be thickeft from A to C, becaufe that is the part which bears the greateft ftrefs. Its thicknefs diminifhes gradually to B, where the fhare is faftened to the ground-reft. This tail is pierced with two round holes at A and B, Fig. 13, through which are put the iron pins DE, FG, Fig. 12. which have fquare flat heads, lying even with the tail of the fhare. Thefe pins pafs through the ground-reft, where they are faftened on the other fide by the nuts EG. A third round hole may be added at *x*, Fig. 13, in order to faften the fhare ftill more firmly to the ground-reft, with a fhort flat headed fcrew.

M. de Chateauvieux has likewife made fome ploughs with the round holes *ab*, Fig. 13, near A and B; that the iron pins DE, FG, Fig. 12, might not traverfe the tenons of the fheat and handles; and inftead of thofe iron pins, he has riveted them with wooden pins, and found them keep the whole tighter together than the iron ones.

To the left fide of the plough fhould be faftened the thin board N, Fig. 1 and 7, the ufe of which is to prevent the earth from tumbling over between the fhare and the mould-board. As plowing wears the point of the fhare, though it will not hurt this fo much as it does that of the common plough, it muft be new pointed from time to time, always obferving to make the point incline a little towards the earth, as is reprefented by the pricked line DL, Fig. 1; that the fhare may fcarcely touch the ground at any other part than D and L, in order to leffen the friction.

The hind part of the plough, thus formed, is joined to the fore carriage, by running the crofs ftaves EF, GH, Fig. 2. through the mortifes of the beams, *gh*; and is fixed there, either by the fcrews *mn*, or the pins *p*, *q*. The traces of the firft and fecond horfe are faftened to the hooks AC; and if a third horfe be ufed, the traces of that third horfe are faftened to thofe of the fecond. Horfes will do better for this plough, than oxen, unlefs thefe laft have been ufed to be harneffed one before the other.

The plough thus equipped, may eafily be carried to the field, if its hind part is laid upon the little carriage ÆW, Fig. 2. confifting of an iron axle-tree ÆW, two fmall wheels *ki*, *lr*, and the two pieces B*t*, D*v*, at the end of which are the hooks B and D. Thefe wheels are about twenty-one inches, or two feet in diameter; and three feet fix inches, or even four feet afunder. They are very light, having but a fmall weight to bear. The hooks of thefe two pieces B*t*, D*v*, are inferted in the rings B and D at the end of the fhafts; and by this means the plough will be carried upon three wheels, of which Fig. 1 and 2 fhew fufficiently the arrangement and ufe. Fig. 5, fhews the flope that fhould be given to the upper furface of the middle of the axle-tree of this fmall carriage, on which the reft of the plough is to be loaded in order to remove it from one place to another, that the ground-reft and other pieces may lie flat and fteady upon it.

To open the firft furrow with this plough, the wheel muft be placed at the laft hole, towards the extremity of the fhafts. This makes the fhare incline the more, and confequently cut the deeper. But as it would be fomewhat troublefome to change the pofition of the wheel, at every firft cut of the plough, a very little attention will remedy that inconvenience. It is only inclining the handles of the plough to the right or left, inftead of holding them even. The whole plough will incline with the handles, and the fhare will then enter into the ground with eafe, and open the firft furrow. The other furrows are plowed without any fort of difficulty; and for them, the plough is to be held even, or inclined but very little, either to the right-hand or the left, as the fituation of the land may require.

M. de Chateauvieux generally refts the beam on the left-hand fide of the fore-carriage. It is eafy to place it fo as to leave whatever diftance is thought proper between the outmoft row of corn and the furrow that is actually plowing.

The forwarder the wheel is fet, the deeper the plough cuts; and fo on the contrary. But if one would have it cut ftill deeper, or fhallower, than it can be made to do by altering the pofition of the wheel, that too may eafily be effected. By loofening a little the wedge above the beam *p*, *o*, Fig. 1. and driving farther in the wedge *q*, the plough will cut lefs deep: as, on the other hand, the fhare will be more inclined, and therefore cut deeper, if the wedge *q* under the beam is loofened, and the wedge *p*, *o*, over it is driven in tighter.

The chief differences between M. de Chateauvieux's plough, and that of M. Duhamel, are as follow.

1. The beam of this laft, ABC, Fig. 1. Plate XXIII. bends from C to B; whereas that of M. de Chateauvieux's is nearly ftrait all along.

2. In confequence of this bending, the hindmoft extremity of M. Duhamel's beam is joined at B to the hindermoft part of the ground-reft E, after paffing through a mortife F, in the lower part of the handles: fo that this beam is joined to the ground-reft by its extremity B, the bottoms of the handles F, and the fheat G; whilft that

of

of M. de Chateauvieux's plough, is joined to the ground-rest by this sheat, another which this plough has not, and the lower part of the handles: for the beam does not answer to the ground-rest.

3. The mould-board HI, Fig. 2, of this plough, is lighter than that of M. de Chateauvieux's, and differently shaped.

4. The two handles KK, are at equal distances from the beam, and are joined together by a cross staff M.

5. The share N, Fig. 3, is pretty much like that of M. de Chateauvieux's plough, but shorter and narrower; so that it cuts less wide furrows, which M. Duhamel rightly thinks the best way of plowing.

6. The coulter O of this plough passes through a mortise in the beam, which is there strengthened by hoops of iron, to prevent the beam's being split by the driving in of the wedges PP which fix the coulter.

M. Duhamel thinks this hind part of his plough preferable to that of M. de Chateauvieux's, for light lands: but it would not do so well in stiff soils, because the earth would be apt to clog about the sheat at Q; whereas it is thrown off by M. de Chateauvieux's plough. M. Duhamel likewise approves of making the beam strait as M. de Chateavieux's is, instead of giving it the bending from C to B, especially for stiff lands.

7. The beam CA, is fixed to the cross staves RR of the fore-carriage of this plough, by the screws and nuts SS.

8. The shafts TT, are fastened before by a cross staff V, which gives great solidity to the fore-carriage, and cannot be added to M. de Chateauvieux's plough; not only because the wheel is too large, but likewise because it must be set forwarder or backwarder, in order to make the share cut more or less deep.

The wheel of this plough is not so large as that of M. de Chateauvieux's, because the axle-tree, instead of being inserted in the shafts TT, is let into the side pieces X, Fig. 4, which are fastened to the shafts by the screws and nuts YY.

The advantages of having the wheel smaller, are, 1. That the plough is less apt to lean too much on its side, and is more easily held upright; 2. That the cross-staff V may be added to the fore-carriage, by which it is rendered more solid; and 3. That the fore-carriage may be made shorter than it otherwise could be.

The bare inspection of the draught of this plough, shews that it is made to cut more or less deep, by screwing the nuts Y more or less tight, and putting a thicker or thinner wedge between the side piece X and the shaft; which is an easier and quicker way, than changing the situation of the wheel. But still, a readier method is, to have under the shafts TT, a false shaft ZZ, Fig. 5, fixed with hinges, &c. for then, by only sticking the peg *a*, into one of the holes *b*, the beam is raised or lowered, in a moment, to whatever degree is thought proper, without altering the position of the wheel.

It is likewise evident, that in order to give the share a greater or less degree of entrance into the earth, nothing more is requisite than to place the beam nearer to, or farther from, the right-hand shaft: for the horses, which are harnessed one before another, go, as does also the wheel, in the last made furrow, and the plowman goes in the furrow actually making.

dd. Are hooks to fasten on the harness of the horses.

ee. Cramps to fasten the fore-carriage.

ff. Pins to fix the beam to the sheat.

gg. Pegs to fasten the cross staves.

h. A strong pin which goes through the hole *i*, to keep the mould-board steady.

Four coultered PLOUGH, an instrument invented by Mr. Tull, being an improvement on the common plough, that makes it cut the pieces of earth into four; that is, it thus divides the earth four times as small as the common plough.

The common two-wheeled plough has of late years become universally used in many countries, and is found greatly preferable to the ploughs they used before; there is an objection to it, indeed, in regard to some stiff and miry lands, in which the wheels become clogged up, and cannot turn. This, however, is easily remedied by twisting thumb ropes of straw about the iron circle and spokes of the wheels; these spreading as they turn, and, as the circle twist bears upon the ground, throw off the dirt, and never clog. The two principal parts of this plough are the head and the tail: the plough-head contains the two wheels and their axis, or spindle, passing through a box, and turning round both in it and in the wheels.

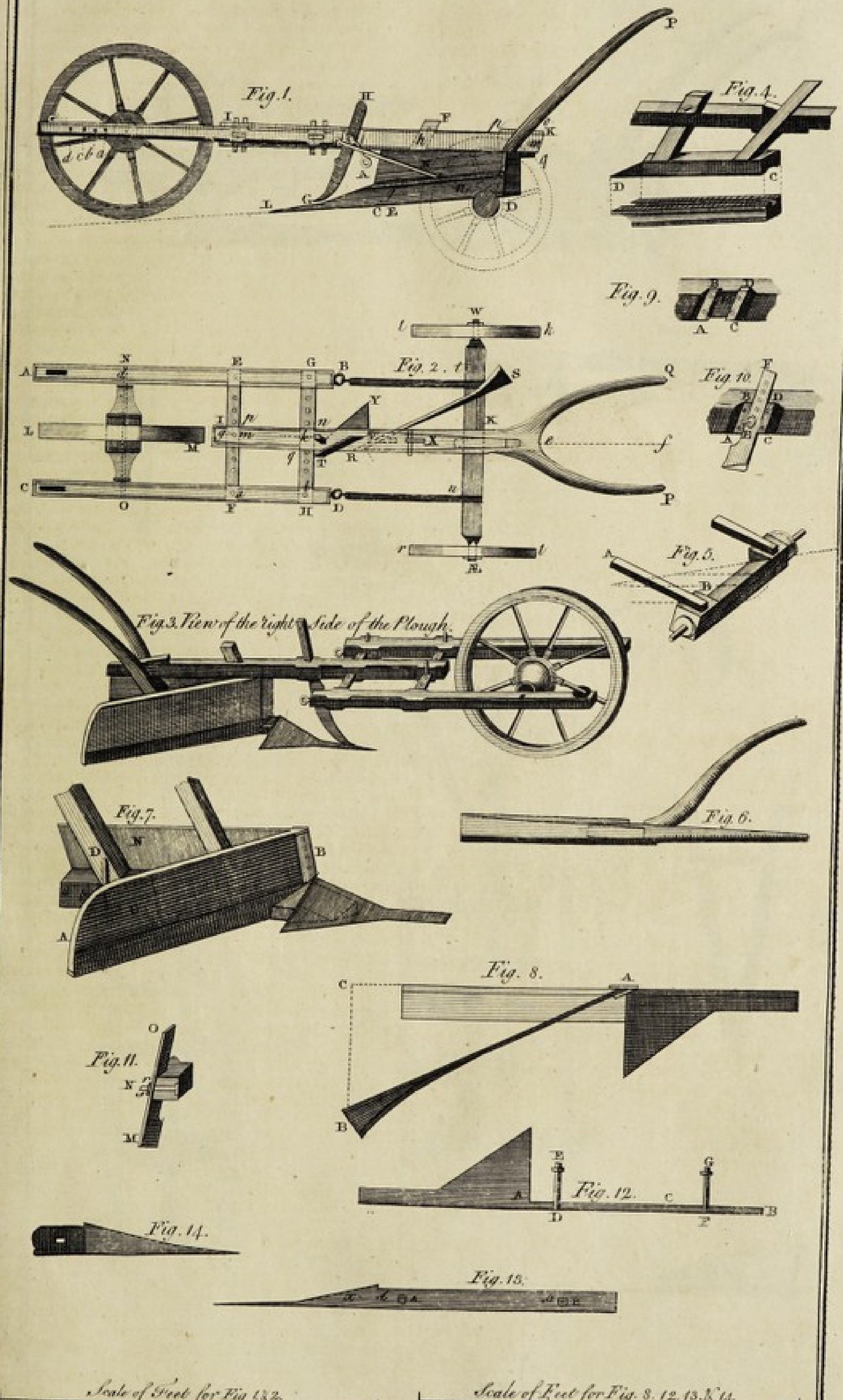
There are fixed perpendicularly in this box two crow-staves, as they are called, which are flat and narrow boards, each having on it two rows of holes, whereby to raise or sink the beam of the plough, by pinning up or down the pillow, to increase or diminish the depth of the furrow. Behind are a pair of gallows, through which the crow-staves pass at the top by mortises, into which they are pinned; and to these are fastened what are called the wilds, which are rings and crooks of iron, by which the whole plough is drawn in the working. From the box to the center of the beam there is carried an iron-chain, consisting of four, five, or more long links, and called the tow-chain: this fastens the plough-tail to the plough-head. It is fixed to an iron collar, fastened in the beam at one end, and at the other passes through a hole in the middle of the box, and is pinned in with a wooden pin.

From the same iron-collar to which the tow-chain is fixed, there is also another chain fastened, called the bridle-chain: this runs above the beam, as the tow-chain does below it, and is composed of smaller and more numerous links. At the upper end, as the tow-chain enters the box of the plough, this bridle-chain is fixed to the top of what is called the stake of the plough: this is a perpendicular stick, carried up parallel with the left crow-staff, and pretty near it, and fastened to it by a wyth or rope, or by the end of the bridle-chain itself, when that is long enough. This stake is also fastened in its lower part, under the gallows, to the same crow-staff, by another wyth or piece of rope.

These are the parts of which the head-part of the plough is composed. The plough-tail consists of the beam carried from the head to the very extremity, and serving as the support and base of all the rest. A little below the collar to which the tow-chain and bridle-chain are fastened, this beam is pierced with a large hole, which lets through the coulter: this is a long and narrow piece, terminating in an edge, and reaching just to the share; and it is fixed immoveably in its place by means of a wedge which is driven into the hole of the beam with it: the office of this coulter is to cut the earth as it is thrown up by the share. Behind these, the same beam is pierced with two more holes, one very near its end: these give passage to two oblong pieces, called the fore-sheat and hinder-sheat, by which the plough-share is supported in its place. To the top of the hinder-sheat there is fastened a short handle by a wooden pin. Parallel to the hinder-sheat there runs up a piece of wood of much the same form, called the drock; and to this is fastened another horizontal piece, called the ground-wrist: these are all on the right-hand side of the plough, and parallel with the fore-sheat. There runs another piece of much the same form with it, on the right-hand; and the bottom of this is the earth-board. The long handle of this, which reaches as far as that of the sheat, is fastened to the drock by a pin, the other end of which goes into the beam. Near the lower end of the fore-sheat, there are two flat pieces of iron, which pass from the two sides of it up to the beam; and being let through it, are fastened to the upper part by screws and pins. These keep the sheat in its place.

The structure of the four-coultered plough is different, in some respects from this, though in general founded on it. Its beam is ten feet long, whereas that of the common plough is but eight. The beam is straight in the common plough, but in this it is arched in one fourth part of its length, near the plough-head. At the distance of three feet two inches from the end of the beam at the plough-tail, the first coulter, or that next the share, is let through; and at thirteen inches from this, a second coulter is let through: a third at the same distance from that; and, finally, the fourth at the same distance from the third, that is, thirteen inches.

The crookedness of the upper part of the beam in this plough is contrived to avoid the too great length of the three foremost coulters, which would be too much, if the beam was straight all the way; and they would be apt to bend



Scale of Feet for Fig 1 & 2.

Scale of Feet for Fig. 8. 12. 13. & 14.

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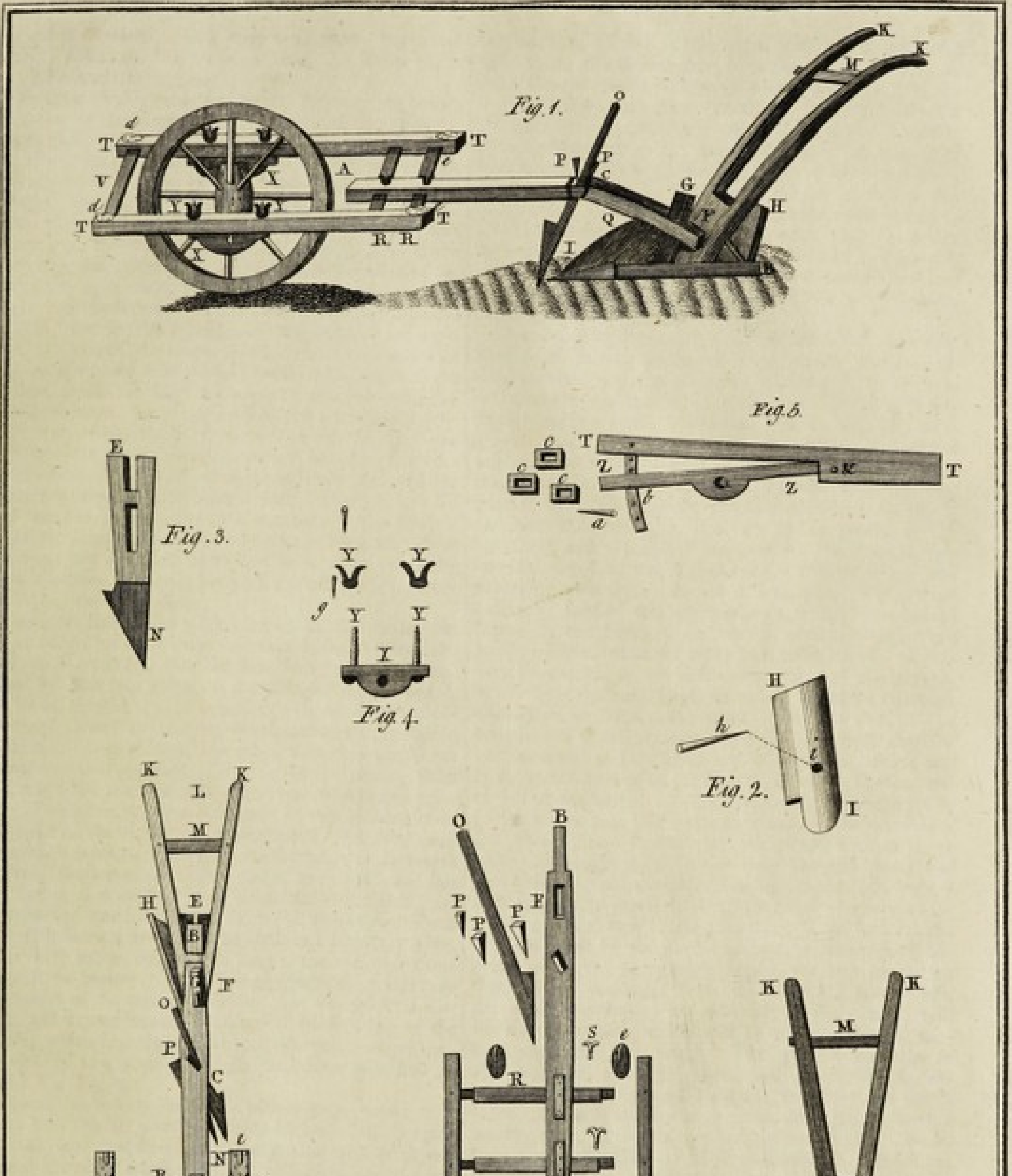
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Scale of 6 Feet.

bend and be displaced, unless they were vastly heavy and clumsy. Ash is the best wood to make the beam of, it being sufficiently strong, and yet light.

The sheat in this plough is to be seven inches broad. The fixing of the share in this, as well as in the common plough, is the nicest part, and requires the utmost art of the maker; for the well going of the plough wholly depends upon the placing of this. Supposing the axis of the beam, and the left side of the share, to be both horizontal, they must never be set parallel to each other; for, if they are, the tail of the share, bearing against the trench as much as the point, would cause the point to incline to the right-hand, and it would be carried out of the ground into the furrow. If the point of the share should be set so, that its side should make an angle on the right side of the axis of the beam, this inconvenience would be much greater; and if its points should incline much to the left, and make too large an angle on that side with the axis of the beam, the plough would run quite to the left-hand; and, if the holder, to prevent its running quite out of the ground, turns the upper part of his plough toward the left-hand, the pin of the share will rise up, and cut the furrow diagonally, leaving it half unploughed. To avoid this and several other inconveniencies, the straight side of the share must make an angle upon the left side of the beam; but that must be so very acute a one, that the tail of the share may only press less against the side of the trench than the point does.

The great thing to be taken care of, is the placing the four coulters; for on this the success of the whole depends. These must be so set, that the four imaginary planes described by their four edges, as the plough moves forward, may be all parallel to each other, or very nearly so; for if any one of them should be very much inclined to, or should recede much from either of the other, then they would not enter the ground together. In order to the placing them thus, the beam must be carefully pierced in a proper manner. The second coulter-hole must be two inches and an half more on the right-hand than the first: the third must be as much more to the right of the second, and the fourth the same measure to the right-hand of the third: and this two inches and an half must be carefully measured from the center of one hole to the center of the other. Each of these holes is a mortise of an anch and a quarter wide, and is three inches and an half long at the top, and three inches at the bottom. The two opposite sides of this hole are parallel to the top and bottom, but the back is oblique, and determines the obliquity of the standing of the coulter, which is wedged tight up to the poll. A perspective view of this curious plough the reader will find in Plate XXI. Fig. 9.

The coulter is two feet eight inches long, before it is worn; the handle takes up sixteen inches of this length, and is allowed thus long, that the coulter may be driven down as the point wears away. *Tull's Horse-hoeing Husbandry.*

Double PLOUGH, an instrument invented by Mr. Randal, which, by putting the share point to the middle of the interval left by the horse-hoe, throws the mould on each side of it, at the same time, towards the rows, and earths them up to what degree the ploughman pleases, in order to nourish them on to perfection. If a common plough, instead of the single hough, was used, the furrows would be turned into the middle of the interval, and appear in the form of a single ridge: and if the plough went twice in a place, to deepen the soil, the ridge in the middle would be proportionably higher, and the ground strangely improved by such operations, and the vegetables surprisingly promoted in their growth. In either of these cases, of the plough's going once or twice in a place, the double plough, by taking fast hold of the mould, throws all back again; and if the vegetables are not effectually earthed up, which may be the case after double spitting the intervals; then running the double plough over again, compleats the business, and strangely tosses about and mellows the mould. This, in general, is the use of this plough in earthing up vegetables, that have three feet intervals.

But under the name of this double plough, we are to understand another of the same form, but much narrower in the tail, to perform what is called ridge-work, which is either single, or double: if single, this double plough works alone, throws up the ridges, and, at a proper time, splits them, and throws them back into the trenches; and this tosses the mould backwards and forwards, which, by these agitations, and other operations, is made ready for cropping, as is particularly mentioned in my Treatise. If these ridges are to be double, that is, if there is to be double spitting, then the double plough performs as before, and goes as deep as is consistent with the interest of the man's arms, and the horse's ease. Here the worthy ploughman is requested to keep his hands even, that the plough may run flat upon its sole, and clear the trench of mould, as far as necessary, which it is made to do in that posture, to make way for the lifting-plough, of the same breadth in the tail. *See* Plate XXI. Fig 10.

Double Lifting-PLOUGH. My earnest desire, says Mr. Randal, to imitate gardeners, in preparing the soil, by their always going a good depth, and which, to be sure, is the true bias of nature, in regard that vegetables, in general, require a looser habitation, beneath the soil, to a greater depth than farmers will allow them: this desire produced the lifting-plough, to raise the generous mould that lies far beneath the reach of common ploughing, into general use. This I have practised to very great effect, and never failed doing it, in all the going ground of the tenures of near a thousand acres, where the stratum, below the usual soil, would give me this desireable and encouraging advantage. Hence it was, that I was always extremely fond of this lifting-plough, which never fails of success in the hands of an honest, worthy ploughman; and, no doubt, there are many such to be found. I was very imprudent, in my first construction of this plough, in having it made too large, in order, through a covetous disposition, to have much work done in a day. The draught was so fatiguing to the horses and men, that the invention was under a good deal of disrepute, and I was in danger of having all the servants leave the service, and of killing the horses: for these reasons, I was obliged to sit down with that loss, great as it was, in the purchase of this plough, and contract all the proportions of it, to make the draught quite easy to the team and men; and then there was not the least complaint heard, but only a backwardness to proceed, which use effectually removed.

Here, then, this lifting-plough is to go into all the trenches made by the double plough, as mentioned before; and as the ploughman deepens the trenches as far down as is consistent with his own and horses ease, the irons, running up on each side of the plough, will lift up the mould, which will be thrown, by the motion, upon the old ridges. The ground now lies in deep trenches, and high ridges, and this is what is called, in my Treatise, double ridges; and how the soil is to be afterwards reduced to a level, and receive farther management, is therein particularly mentioned. Now, from the construction of these two ploughs, the soil beneath will, if the ploughman keeps his hands even, be cut level, instead of leaving there hills and dales, but too often practised, to the discouragement of the growth of the vegetables. *See* Plate XXI. Fig. 11. *Randal's Semi-virgilian Husbandry.*

PLOUGHING, the action of breaking up, and loosening the soil.

" The principle, says M. de Chateauvieux, of thoroughly dividing and loosening the soil, is so generally received, that there is not a farmer, who does not know, that one ploughing more than ordinary is of as much service to his ground, as dunging it would be. Experience must have shewn them, that his crops are increased by this extraordinary ploughing: but he is not sufficiently sensible, that of all the ways of improving his land, no one is more effectual, or less expensive than this. Were its full value known, it would be more generally practised, and every husbandman would give all his lands at least one ploughing extraordinary.

" To satisfy myself of what might be done with the plough alone, I resolved to make a trial on a spot of ground which I knew to be incapable of naturally producing any thing. Some years before, I had dug away the earth, three feet deep, from a space of sixty square perches. Nothing remained in it but a white clay, like that which potters use. This spot, thus circumstanced, seemed to me a proper one for my experiment. As the space

ſpace was too ſmall for a plough to work in, I had recourſe to the ſpade and hoe. The ground was laid out in beds, which were afterwards ſowed with wheat, and the ſpaces between them were frequently ſtirred. The firſt year, my plants were very poor, and branched into only two, three, or four ſtalks apiece. In the ſecond year, they did much better; and in the third, they were as large and fine as any my garden could have produced. This ſpot ſtill continues to produce equally well; the ſoil is now like fine mould; and, which is very remarkable, it has loſt its former white colour, and is become black. We have here a ſtrong inſtance of what may be done by pulverizing the earth. Let us but do the ſame with any of our bad lands, and perſevere in ploughing and ſtirring them a ſufficient time; the ſucceſs will not be doubtful.

"To be ſtill farther convinced of the truth of this important maxim in huſbandry, that the earth ſhould be thoroughly looſened by deep and frequent ploughings, I examined very carefully, whether my lands which had been prepared by repeated ploughing only, without the aſſiſtance of any dung or manure, were more looſened and rendered lighter, than thoſe which were under the common management. All my obſervations proved that they were. The firſt glance of my eye ſhewed me, that their ſurface was ſmoother; on ſounding the furrows, I found them deeper; and much leſs ſtrength was required to plough them; two horſes, or ſometimes only one, or a ſingle ox, doing here with eaſe, what would otherwiſe have employed double that number of cattle: a manifeſt proof that my grounds were in excellent tilth; whereas the common fields offered nothing pleaſing or ſatisfactory to the eye; the earth there was extremely hard, cloſe, and compact, and its ſurface almoſt as firm as that of a beaten road. The ground which had been well and often ploughed remained ſo light and ſoft, after its crop of wheat was taken off, that I thruſt a ſtick of green willow eight or ten inches deep into it without the leaſt difficulty, though I could not by any means puſh it at all into the land cultivated in the common way."

Camillo Tarello, a native of Lonato in the Venetian territories, concerned to ſee the neglected and dreadful miſmanaged ſtate of huſbandry in his country, wrote his ſmall, but highly valuable treatiſe of Agriculture, and preſented it to the ſenate of Venice under the title of *Ricordo d'Agricultura*. The ſenate, in juſtice to the excellency of this work and the patriotic intentions of its author, granted him, on the 29th of September 1566, not only the ſole right of vending his book, but alſo ordered at the ſame time that all ſuch as adopted his new method of huſbandry, ſhould pay to him, and afterwards to his deſcendants, four marchetti (about three halfpence of our money) for every acre of corn land, and two marchetti for every acre of other land, planted according to his direction. The Berne Society have favoured the public with the firſt part of Tarello's excellent treatiſe; and we ſhall take from thence the following extract as a farther proof of the neceſſity of thorough ploughing.

"When we conſider, ſays that good patriot and intelligent huſbandman, Camillo Tarello, that every ear of wheat yields fifty grains (we will ſuppoſe that to be the medium number), we may infer, that if all theſe were ſowed and grew, we ſhould reap fifty times as much as was ſown: but our crops are far from being ſo abundant. This failure cannot proceed from any other cauſe than that all theſe grains do not riſe and proſper; nor can any but one, or all, of the ſeven following reaſons be aſſigned for it, if we except bad ſeaſons and extraordinary accidents.

"The deficiency ariſes either 1, from the ſeed; or 2, from rain, when the corn is in bloom; 3, from winds, when its ſtalks are large; 4, from birds, which eat up the grains that have been ſown; 5, from worms and inſects; 6, from the earth; or, 7, from the cultivator himſelf.

"The cauſe of this defect is not in the ſeed: for, either the ſeed is good, or it is not: if it be not good, the grains will not riſe at all; but if it be good, as we ſuppoſe it to be, each grain may, and ſhould, produce at leaſt one ear. Another proof is, that if a parcel of ſeeds are planted at a proper depth, one by one, in holes made on purpoſe for them, and an equal number of the ſame kind of ſeeds are ſowed at random in the ſame ſort of ground, all the former will riſe, but not all the latter.

"Neither ought it to be aſcribed either to rain or winds, at the time of the bloſſoming of the corn: becauſe we do not reap fifty for one, even when the weather is then very fine; and even when each ear bears fifty grains, we do not reap fifty times the ſeed.

"Nor ought we to accuſe the birds of the air: it being well known that lupins, which they never touch on account of their bitterneſs, do not all riſe; for if they did, the crop would be ſtill more conſiderable, as each of theſe plants bears from fifty to ſixty ſeeds. Beſides, what the birds eat is not conſiderable.

"Worms and inſects are not the cauſe, for three reaſons, firſt, our crops are very little better even when neither worms nor inſects are to be ſeen; ſecondly, the caſe here is the ſame as that of the lupins; and, thirdly, the worms would ravage whole fields (as they ſometimes do) in ſo viſible a manner, that it would be eaſy to diſtinguiſh the cauſe of the miſchief. However, this is an extraordinary and pretty rare event.

"The ſame may be ſaid of fogs, cold, bad weather, reptiles, and other miſchievous creatures. Though theſe enemies do not injure our fields every year, we nevertheleſs conſtantly reap leſs corn than they might be made to produce.

"Laſtly, the earth is not in itſelf the cauſe of this ſcantineſs of increaſe: for the Creator has endowed it with perpetual youth and fruitfulneſs, as Columella juſtly and prettily obſerves in the firſt chapters of his firſt and ſecond books. The earth and nature are always the ſame.

"Now, if the uſual cauſe why we do not reap fifty for one cannot be imputed to either of the things above-mentioned, it muſt of neceſſity be ſought for in the ignorance, negligence, and indolence of the huſbandman: for our practiſe is diametrically contrary to that of the ancient Romans. They plowed often, and ſowed little; yet every family lived upon the produce of its ſmall farm: but we who plow little and ſow a great deal, are always diſappointed."

The Romans were not only extremely attentive to the thorough culture of their land, but alſo, even in the latter time of the republic, laid it down as a maxim to be followed by all good huſbandmen, "to ſow but little and plow much." This is ſtrictly enjoined by Virgil; and Pliny, who inſtances the huſbandry of Creſinus, as an example of the good effects of this practice, laments the deplorable condition of Italy, when rich men, with the help of their numerous ſlaves, farmed large diſtricts of land; becauſe it diminiſhed the number of Roman citizens, and rendered the country leſs fruitful: for, as both he and Columella obſerve, the Romans then became dependant on other nations for the means of ſubſiſtance.

May not this naturally lead us to caſt an eye upon our own country, where, of late years, gentlemen throw their eſtates, as much as poſſible, into large farms, which, in the language of Mago the Carthaginian, muſt, in general, render the farm ſtronger than the farmer, whereby it neceſſarily becomes leſs fruitful? This practice is attended with another moſt fatal conſequence to a manufacturing and trading people: it leſſens the number of inhabitants in the country, from whence only the ſupply of population ariſes; for cities and large towns are always an expence of men.

Whilſt we beſtow this due commendation on plowing, we do not mean to recommend it on Mr. Tull's principles, "that dividing and pulverizing the earth is all in all." When the earth is in fine tilth, ſo that the roots of plants can eaſily extend themſelves every way, an advantage ariſes, which is thus deſcribed by the ingenious M. J. J. Biberg, in his Œconomy of Nature.

"Plants, as well as living creatures, muſt ſubmit to death. They ſpring up, they grow, they flouriſh, they ripen their fruit, they wither, and at laſt, having finiſhed their courſe, they die, and return again to the duſt, from whence they firſt took their riſe. Thus the black mould which we ſee upon the ſurface of the earth, is chiefly owing to dead vegetables. For all roots deſcend into the earth by their branches, and after a plant has loſt its ſtem, the root remains; but this too rots at laſt, and changes into mould. By this means, this kind of mould is mixed with the earth, by the contrivance of nature; nearly in

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the ſame way as dung thrown upon fields is wrought into the earth by the induſtry of the huſbandman.

" The earth thus prepared offers again to plants from its boſom, what it had received from them. For when ſeeds are committed to the earth, they draw to themſelves, accommodate to their nature, and turn into plants, the more ſubtile parts of this mould, by the co-operation of the ſun, air, and moiſture; ſo that the talleſt tree is, properly ſpeaking, nothing but mould wonderfully compounded and modified by a virtue communicated to a ſmall ſeed by the Creator. From theſe plants, when they die, juſt the ſame mould is formed, as give birth to them originally; but in ſuch a manner, that it is in greater quantity than before, if the earth be kept looſe to admit of the free extenſion of the roots. Vegetables therefore increaſe the black mould; whence fertility remains continually uninterrupted: whereas the earth would not make good its annual conſumption, if it were not conſtantly recruited by new ſupplies."

The illuſtrious M. Lullin de Chateauvieux, to whom the world in general is infinitely indebted for ſome of the moſt judicious and beſt executed experiments ever made in Agriculture, as is his native country in particular for his excellent adminiſtration in the high office of chief magiſtrate of the republic of Geneva, is the firſt writer who has attended to the advantages of ſtubble as a manure.

Towards the latter end of the year 1753, walking over his grounds after harveſt, he was ſtruck with the difference which he found in the ſtubble of his own experiments, and that of the corn which had been raiſed in the common way. This laſt was ſo poor and weak, that it ſcarcely oppoſed the motion of his feet, while the other reſiſted greatly. " I often felt it break, ſays he, under my feet, and frequently met with tufts of twenty, thirty, forty and ſometimes more ſtalks, which ſtopt me ſhort, like ſo many little buſhes. I am the more particular in my account of this ſtubble, becauſe it ſhews the great ſtrength of the plants, which they would not have had if the earth had not been well prepared. Beſides, it has its real uſe: for thorough plowing ſupplies the want of dung, not only by keeping the earth conſtantly in a looſe ſtate, but likewiſe by the quantity of ſtrong ſtubble which it produces, and which affords a moſt excellent manure attended with no expence. It lies ready upon the ſpot; the plowing of the earth buries it; and as it is a long time in rotting, it helps to keep the ſoil looſe and light, and is repeated every year. I have found ſtubble almoſt whole at a year's end, and have ſeen ſome not quite conſumed at the end of two years. From what I have ſeen of its effects, I will venture to ſay, that it contributes greatly to increaſe the productions of the earth. I have very often plucked up plants remarkable for their beauty, and have frequently found their roots interwoven with tufts of ſtubble, which ſhewed me the cauſe of their extraordinary growth."

" It is often, ſays Mr. Duhamel, more advantageous to increaſe the fertility of land by plowing, than by dung: 1, Becauſe, in general, only a certain quantity of dung can be had, the product of twenty acres being ſcarcely ſufficient to produce enough for four or five; whereas the particles of the earth may be divided and ſubdivided almoſt to infinity. The help derived from dung is therefore limited; whilſt no bounds can be ſet to the benefits that may accrue from plowing.

" 2, Few plants raiſed in dung ever have the fine flavour of thoſe which grow in a good ſoil moderately dunged. Our kitchen gardens and our other grounds afford daily inſtances of this truth. Pulſe, pot-herbs, and fruit, are ſeldom ſo good in the neighbourhood of great cities, where dung abounds, as in country gardens, where but little of it is uſed. The corn raiſed in thoſe exceſſively dunged lands, yields a great deal of bran, and not much fine flour, and is difficult to keep. Nice horſes will not eat oats of the growth of fields manured with human ordure. But nothing is ſo ſtriking as the difference between the wine of an undunged vineyard, and that of vines which have been greatly dunged.

" 3, Dung, which is ſuppoſed to act by fermentation, cauſes indeed an inward diviſion of the particles of the earth, which muſt be very uſeful, as well as the food which it furniſhes to plants: but the plough, beſides dividing thoſe particles, changes their ſituation, and turns the ground upſide down, ſo that the part which was expoſed to the influences of the air and dews, takes the place of another part, which is brought from within the earth, up to its ſurface. The conſequence of this is, that well-plowed land is not exhauſted by weeds, and that it admits the moiſture of rains and dews, together with the rays of the ſun, all of which contribute greatly to render it fertile, as has been proved by very many experiments.

" 4, Dung attracts inſects, and thoſe inſects gnaw plants. It is well known that the roots of trees planted in dunged ground, are very liable to be damaged by inſects; and this is one of the chief reaſons why floriſts baniſh dung from their gardens. Worms, grubs, and other ſuch like vermin, make dreadful havock in their beds of flowers; and I have ſeen meadows where the graſs has been entirely deſtroyed, by their eating its roots.

" I muſt add, that moſt ſorts of dung contain a great many ſeeds, which fill the land with weeds.

" 5, It is true that dung is equally ſerviceable to light lands, and to ſtrong; but the ſame may be ſaid of plowing.

" Land is too ſtrong when its particles lie ſo cloſe together, that the roots of plants cannot extend between them, without great difficulty, in queſt of their neceſſary food, for want of which they will remain poor and ſickly. But when the ground has been well looſened by repeated plowings, and its particles are ſet at greater diſtances from each other, thoſe roots will be able to ſpread freely on all ſides, to pervade every minute chaſm, and to collect ſuch quantities of food, as will make the plants grow ſtrong and vigorous. The friendly influences of the atmoſphere will then penetrate to them. What plainly proves the good effects of looſening ſuch ſoils, is, that their fertility is ſometimes increaſed by a mixture of ſand, inſtead of dung. Now ſand does not afford any nutritive ſubſtance; but only hinders the particles of the earth from re-uniting too cloſely.

" Plowing is equally beneficial to light lands, for the very contrary reaſon; though theſe do not require ſo much of it as the other. There is no danger of their being exhauſted by any expoſure to the ſun; but, on the contrary, they acquire an additional degree of fertility by the ſtirring and grinding of their particles, and are thereby the better fitted to receive the moiſture of rains and dews, and the ſalutary influences of the air and ſun; whilſt their inward pores are at the ſame time better adapted to the proper extenſion of the roots of plants, by their being leſſened.

" But, let the benefits ariſing from dung be ever ſo great, let the means of obtaining enough of it be ever ſo eaſy, and let even its defects be corrected as much as can be; ſtill it will not be the leſs true, that frequent plowing is of infinite ſervice to land.

" For this reaſon it is, that land intended for wheat is plowed three or four times before the grain is ſowed. Some farmers, who could not dung all their lands, plowed part of them double the uſual number of times, and reaped greater crops from theſe, than from thoſe which were dunged. The expence of three plowings extraordinary will be much leſs than the price of the dung neceſſary for the land, if the farmer is obliged to purchaſe it.

" In 1759, M. Delu gave three plowings to ſome of his fields intended for oats; and though that year was very dry and unfavourable to ſpring-corn, his oats kept up well till they were perfectly ripe, and yielded a full crop of excellent grain.

" He gave five plowings to a piece of wheat-land, which had not been dunged, and, at harveſt, had taller and finer corn there, than in the neighbouring grounds which had been dunged and cultivated in the uſual way.

" In ſhort, the advantage of thorough tillage, while the plants are growing, is ſo great, that, in many places, it has been found amply to repay even the expence of digging between the rows of corn."

PLOUGH-WRIGHT, a perſon whoſe buſineſs it is to make ploughs, and other implements of huſbandry.

PLUM-TREES. All the ſpecies of plums have within their fruit a hard ſtone, within which there is contained a ſoft and tender kernel: this kernel contains the ſeminal plant, from which would be produced another tree of the ſame kind, if it were ſet in the ground; and it is very

natural

natural to ſuppoſe, that the only uſe of the thick ſtone or huſk of this was only to preſerve its tender ſubſtance from rotting too ſoon in the earth, and to give it a proper time for developing its parts, to preſerve its natural oilineſs during that time, and to furniſh from its own ſubſtance a proper nouriſhment to the growing plant; for obſervation ſhews, that it finally breaks into a very fine powder.

There has not been found any ſpecies of plum which had not its kernel contained in a ſtony coat of this kind, from whatever grafts they have been propagated; nor is there any art known by which the kernel of this ſort of fruit can, while growing, be deprived of its coat.

Mr. Marchand, however, in the year 1735, ſhewed, before the academy of ſciences at Paris, certain plums, whoſe kernels had no ſtone or ſhell round them; and found that they grew upon a tree which never had produced any others, and which had been known to produce ſuch for twenty years. The kernel in theſe was covered with a reddiſh ſkin, which was rough to the touch; and, within that, with another, which was thinner and white. The kernel had nothing particular in it, except that it carried on one ſide of its outer ſurface, and that always in the ſame place, a little ſtony prominence, more or leſs dented on its convex part: this is uſually a twelfth of an inch broad, and two thirds of an inch long, and has no other appearance but that of a diſtempered part of the kernel, only that all the kernels have it.

The thick wrinkled ſkin which ſurrounds the kernel, ſeems in this caſe to ſupply the place of the ſtone or hard ſhell; and in this alſo it reſembles it, that the pulp of the fruit parts eaſily and readily form it: and the hard oblong body, which is placed on one ſide of the kernel, is by no means proper for this purpoſe. *Mem. Acad. Sciences, Par.* 1735.

All the ſorts of plums are propagated by budding, or grafting them upon ſtocks of the muſcle-plum, the white pear plum, the St. Julian, or the *bonum magnum.*

Budding is much properer than grafting for theſe trees, as they are apt to throw out a great deal of gum from the wound: and the trees ſhould be no more than one year's growth from the bud, when they are tranſplanted; for, if they are more, they ſeldom ſucceed well, being very ſubject to canker; and if they eſcape that, they uſually produce only two or three luxuriant branches. The whole management of planting and pruning them is the ſame with that of peaches. *See* PEACH.

If the walls againſt which they are planted are low, they ſhould be ſet eighteen feet aſunder; if they are higher, then fourteen or ſixteen.

Plums ſhould have a middling ſoil, for they ſeldom ſucceed well in too moiſt or too dry a one; and, when planted againſt walls, ſhould have an eaſt or a ſouth-eaſt proſpect. If they have one at full ſouth, they are apt to ſhrivel up, and become mealy. Plums in general ſucceed very well with proper care on eſpaliers; they will alſo bear very well as ſtandards, but the fruit will not be ſo well taſted. Plums do not only produce their fruit on the laſt year's wood, but alſo on ſpurs that come out of the wood at two or three years old. It is a common error to be too free with the knife in the winter pruning, cutting off the extremities of all the branches; the conſequence of which is, that there is an over quantity of young ſhoots produced, and the fruit is ſmall and poor. *Miller's Gard. Dict.*

POA, meadow graſs, or that common ſpecies of graſs, that principally forms the green covering of our fields.

POCKET, a large ſort of bag in which wool is packed up, in order to be ſent from one part of the kingdom to the other.

POD, a term uſed to expreſs a pericarpium, conſiſting of two valves, which open from the baſe to the point, and are ſeparated by a membranaceous partition from which the ſeeds hang by a kind of minute ſtalk.

POKE, a ſack, or bag.

Hop POLES, the upright poles, or pieces of wood, round which they bind, twiſt, and ſupport themſelves. *See the article* HOP.

POLLARD, or *Pollanger*, a tree that has been frequently polled or lopped, and its top taken off.

POLL-EVIL, an abſceſs near the poll of a horſe, formed in the ſinuſes between the noll bone, and the uppermoſt vertebræ of the neck.

If it proceeds from blows, bruiſes, or any external violence, at firſt bathe the ſwelling often with hot vinegar; and if the hair be fretted off with an oozing through the ſkin, make uſe of two parts of vinegar, and one of ſpirit of wine; but if there be an itching with heat and inflammation, the ſafeſt way is to bleed, and apply poultices with bread, milk, and elder flowers: this method, with the aſſiſtance of phyſic, will frequently diſperſe the ſwelling, and prevent this evil.

But when the tumor is critical, and has all the ſigns of matter, the beſt method then is to forward it by applying the ripening poultices already taken notice of, till it comes to maturity, and burſts of itſelf; or if opened with a knife, great care ſhould be taken to avoid the tendinous ligament, that runs along the neck under the mane: when matter is on both ſides, the opening muſt be made on each ſide, and the ligament remain undivided.

If the matter flows in great quantities, reſembles melted glue, and is of an oily conſiſtence, it will require a ſecond inciſion, eſpecially if any cavities are diſcovered by the finger or probe; theſe ſhould be opened by the knife, the orifices made depending, and the wound dreſſed with the common digeſtive of turpentine, honey, and tincture of myrrh, and after digeſtion with the precipitate ointment; or waſh the ſore with the following, made hot, and fill up the cavity with tow ſoaked in it.

> Take vinegar or ſpirit of wine, half a pint, white vitriol diſſolved in ſpring water, half an ounce, tincture of myrrh, four ounces.

This may be made ſharper by adding more vitriol; but if the fleſh is very luxuriant, it ſhould firſt be pared down with a knife before the application; with this waſh alone Mr. Gibſon has cured this diſorder without any other formality of dreſſing, waſhing with it twice a day, and laying over the part a quantity of tow ſoaked in vinegar and the white of eggs beat together. This laſt application will ſerve inſtead of a bandage, as it will adhere cloſe to the poll, and come off eaſy when there is occaſion to dreſs. Some waſh with the phagædenic water, and then fill up the abſceſs with looſe doſſils of tow ſoaked in Ægyptiacum and oil of turpentine made hot, and continue this method till the cure is effected.

But the moſt compendious method of cure, is found by obſervation to be by ſcalding, as the farriers term it, and is thus proſecuted when the ſore is foul, of a bad diſpoſition, and attended with a profuſion of matter.

> Take corroſive ſublimate, verdigreaſe in fine powder, and Roman vitriol, of each two drams; green copperas half an ounce; honey or Ægyptiacum two ounces, oil of turpentine and train oil, of each eight ounces; rectified ſpirit of wine four ounces: mix together in a bottle.

Some make their ſcalding mixture milder, uſing red precipitate inſtead of the ſublimate; and white vitriol inſtead of the blue; the following has been ſucceſsfully uſed for this purpoſe, viz. half an ounce of verdigreaſe, half a pint of train oil, four ounces of oil of turpentine, and two of oil of vitriol.

The manner of ſcalding is firſt to clean the abſceſs well with a piece of ſponge dipped in vinegar; then put a ſufficient quantity of the mixture in a ladle with a ſpout, and when it is made ſcalding hot, pour it into the abſceſs, and cloſe the lips together with one or more ſtitches. This is to remain in ſeveral days, and if good matter appears, and not in an over great quantity, it will do well without any other dreſſing, but bathing with ſpirit of wine; if the matter flows in great abundance, and of a thin conſiſtence, it muſt be ſcalded again, and repeated till the matter leſſens and thickens.

Theſe liquid corroſive dreſſings agree well with horſes, whoſe fibres are ſtiff and rigid, and whoſe juices are oily and viſcid; in this caſe they contract the veſſels of the tendons on the hind part of the head and upper part of the neck, which are continually ſpewing out a matter or ichor that can hardly be digeſted, or the profuſion abated without ſuch applications as theſe.

POND, a reſervoir or receptacle for collecting and preſerving water.

The neceffity of water, in all paftures, is felf-evident; as cattle cannot live without it, and the driving of them far for it is known to be prejudicial to their health, in hot weather, befides being attended with great trouble, and a confiderable lofs of time. This is fo fenfibly felt in many parts of England, that people are obliged to dig wells, even to fuch a depth as, frequently, to require the affiftance of a horfe to draw up the water. The means of rendering it eafily come at, muft therefore inhance the value of the land where it can be fo procured, and are of very effential confequence to the hufbandman.

Where the furface of the ground is fand or gravel, there feldom is occafion to dig deep for water; becaufe fuch foils generally lie upon marle, or fome other rich earth, through which the water cannot defcend. Beds of clay are moft commonly thicker than thofe of fand or gravel; and chalk is, too often, the thickeft of all. But wherever water is wanting, the farmer fhould bore through the incumbent earth, if he intends to fit his land for pafture: and if he finds the expence of obtaining it too great, his beft way will be to convert the ground fo circumftanced into arable, or to plant it with timber-trees fuited to the nature of the foil.

Wherever water ftagnates in a fandy or gravelly foil, the hufbandman fees at once at what depth is the furface of the earth which retains it. But in other foils, and when this does not happen, Palladius, and the authors of the *Maifon Ruftique*, give the following directions how to feek for water, with the greateft probability of fuccefs.

Where rufhes, reeds, flags, willows, or other aquatic plants grow fpontaneoufly, or where frogs are obferved to lie fquatted down clofe to the ground, in order to receive its moifture, there generally is water underneath. Perfons who make it their bufinefs to find out fprings for fountains, cafcades, &c. look upon it as an infallible fign of fubterranean water, when they fee a vapour arife frequently from the fame fpot of ground. Others affure, that wherever fwarms of little flies are feen conftantly flying in the fame place, and near to the ground, in the morning, after funrife, there certainly is water under that fpot. Again, where water is wanted on land apparently dry, let a man, before fun-rife, lie down flat upon his belly, refting his chin upon his fift placed clofe to the ground, that his view may be directed quite horizontally, and not rife too high, and in that fituation let him look ftedfaftly toward the eaft. If he then fees a tremulous vapour arife from any particular fpot, let him mark the place, by noticing fome neighbouring tree, fhrub, or other indication, and he will find water underneath it. But this experiment is to be made only on ground whofe furface is dry; becaufe other exhalations, from a damp furface, would be apt, in this cafe, to miflead the enquirer.

Another way is thus. Dig a hole three feet wide, and at leaft five feet deep, and place at the bottom of it, when the fun is about to fet, a pan, or bafon, rubbed with oil on the infide: let the bottom of this veffel be uppermoft; cover it with dry hay, fern, or rufhes, and over that with earth; and if any drops of water are found ftanding on its infide the next day, a fpring is probably not far off. Or, put a new, unbaked, but well dried, earthen veffel into fuch a hole, and cover it as before; and if there be water in that place, this veffel will be found foft and wet the next day. Likewife if wool be left all night in a trench of this kind, and water can be fqueezed out of it the next day, little doubt remains but that of plenty of water may be met with there.

The month of Auguft is generally looked upon as the moft proper time to fearch for water; becaufe, we apprehend, as the heat of the preceding fummer will have warmed the earth to a confiderable depth, any fteam arifing from water refting on an impervious foil underneath, and particularly in hollows on the furface of that impervious foil, will then be moft exhaled by this warmth. Now it is this fteam, or vapour, which produces the before-mentioned figns.

By whatever method water is found, the means of coming eafily at it are the next confideration. If it be on a plain, there is no other way than digging a well. In doing this, the fubftance under the fand or light foil muft be dug into, to form a refervoir of water for occafional wants; and this refervoir fhould be made deep and large, in proportion to the quantity wanted. If there were no fuch refervoir, the water, after having rifen a little above the impervious body underneath, would glide along its furface, as ufual, and very little of it could then be obtained, either by pumps, buckets, or any other way employed to raife it. If the well is made in a floping ground, and the declivity is fufficient to give it an horizontal vent, it will be worth the hufbandman's while to dig fuch a paffage, and, by means of pipes, or any other conveyance, to carry the water acrofs the light foil, through which it would otherwife fink. The greateft quantity of water will be obtained in this manner, becaufe there will then be a continual ftream.

If the foil is very deep, and its furface has inequalities in which rain water runs in any quantity; this may be collected in ponds made in the loweft parts of fuch grounds.

If a body of clay is found near the furface, it is worth the farmer's while to bore, that he may know at what depth a bed of fand or gravel may be met with: for he will be fure to find plenty of water in this laft. If this be in a declivity, he need only cut an horizontal paffage, and the water will flow fo freely as even to double the value of his land.

Here again the farmer needs not ever to be at a lofs, becaufe it cannot be very difficult to make a pond in a clayey foil, which is, of itfelf, retentive of water. But it may, perhaps, be advifable, even in this, to cover the bottom of the pond with a coat of gravel, in order to prevent its being poached by cattle, whofe feet would otherwife be apt to fink deep into clay. Some farmers judicioufly pave the declivity by which the cattle enter into the pond, and this renders it much more lafting than it would otherwife be, and preferves the water clean.

When ponds are made in a loofe foil, much more care is neceffary. The bottom and fides there muft be covered with a thick coat of the tougheft clay, from a foot to two feet thick, well rammed down. Some have added hair and loam to the outer part of this covering, with a view of rendering it lefs liable to chap: but a thick coat of gravel is more neceffary here, that the feet of the cattle may not pierce through the clay. Perhaps the expence of paving the whole infide of a pond, might, in the end, be money well laid out.

The greateft difficulty of finding water is in chalky foils, becaufe thefe are not, of themfelves, very retentive of it, and generally lie in fuch thick beds, that it is expenfive to dig through them. However, it fhould be tried; and if fand or gravel be found underneath, water may be depended on. Even here, ponds are eafily made, by digging into the chalk, and lining them with a coat of clay, as before directed. If there is a fupply of proper manure, fuch as clay, or marle, this fituation is well adapted to grain, which loves to ftand dry; and as this kind of ground produces more forward crops than clayey or ftrong foils, it may be fowed early with corn, which will not, in that cafe, be fo apt to be parched up as grafs is, by the fummer's drought. If a good foil can be made here, a foot deep, it will yield plenty of various forts of pafture, either roots or graffes, as the farmer fhall judge moft proper: or it may be planted with different kinds of timber-trees. For the method of making ponds in gardens, *fee the article* GARDEN.

POPLAR, a genus of trees, of which botanifts enumerate four fpecies; viz. the common white poplar, with large leaves: the common white poplar, with fmaller leaves: the common black poplar, and the poplar with trembling leaves, called the afpen-tree. The poplar, whether black or white, may be eafily propagated, either by layers, cuttings, or fuckers, of which the white kind always produces a great many from the roots. The beft feafon for the tranfplanting thefe fuckers is in October, when the leaves begin to decay; and they fhould be removed into a nurfery for two or three years, at the end of which time they will have got ftrength enough to be tranfplanted into the places where they are to remain.

When they are to be propagated by cuttings, it is beft to do that in February, cutting off large truncheons of eight or ten feet long; which, being thruft down a foot deep in the ground, will take root very quickly, and, if the foil be moift, will grow to a confiderable fize in a few years.

The black poplar is not so easily raised from these large truncheons, but should be planted in cuttings, of about a foot and a half long, planting them a foot deep in the ground. This will grow on almost any soil, but does much better on a moist one than on any other. They are the fittest of all trees for raising a shade quickly, as they will grow fourteen feet in height sometimes in one season, and in four or five years will be large trees.

A considerable advantage may be obtained by planting these trees upon moist boggy soils, where few other trees will thrive: many such places there are in England, which do not, at present, bring in much money to their owners; whereas, if they were planted with these trees, they would, in a very few years, over-purchase the ground, clear of all expence: but there are many persons in England, who think nothing, except corn, worth cultivating: or, if they plant timber, it must be oak, ash, or elm; and, if their land be not proper for either of these, it is deemed little worth; whereas, if the nature of the soil was examined, and proper sorts of plants adapted to it, there might be a very great advantage made of several large tracts of lands, which at this time lie neglected.

The wood of these trees, especially of the white, is very good to lay for floors, where it will last many years; and, for its exceeding whiteness, is, by many persons, preferred to oak; but, being of a soft contexture, is very subject to take the impression of nails, &c. which renders it less proper for this purpose: it is also very proper for wainscotting of rooms, being less subject to swell or shrink, than most other sorts of wood: but for turnery-ware, there is no wood equal to this for its exceeding whiteness, so that trays, bowls, and many other utensils, are made of it; and the bellows-makers prefer it for their use; as do also the shoemakers, not only for heels, but also for the soles of shoes: it is also very good to make light carts; the poles are very proper to support vines, hops, &c. and the lopping will afford good fuel, which in many countries, is much wanted. *Miller's Gard. Dict.*

POPPY, the name of a plant, of which several species are cultivated in gardens for the beauty of the flowers. They are all easily propagated by sowing the seeds in autumn. When the young plants come up, they are to be cleared from weeds, and thinned to a proper distance by pulling some up, where they stand too thick; for they never thrive well, if they are to be transplanted. They are to be left, according to their sizes, at six, eight, or ten inches distance.

They are very showy flowers, and make a splendid appearance in gardens; but they are but of a short duration, and are of an offensive smell, which makes them less valued at present than they have been.

Some sow these plants in spring, but it is not so well; because they then have not time to get strength before autumn, when they are to flower; and, for that reason, those sown in spring usually flower weakly. *Miller's Gard. Dict.*

Red POPPY, or *Red-weed.* The common wild red poppy is one of the most mischievous weeds the farmers are plagued with among their corn, and it is the most difficult to thoroughly destroy of almost any other. Its seed will lie a long time in land unploughed, without ever shooting; but they will be sure to grow with every crop of corn. Mr. Tull gives an instance of the seeds of this plant being buried four and twenty years in a field of saintfoin, and at the end of that time, the land being ploughed for wheat, they all grew up among the corn, though they had lain dormant so long before. *Tull's Horse-hoeing Husbandry.*

POTATOE, or POTATO, the name of a well known plant, the roots of which make a very nourishing food.

Mr. Houghton describes the potato to be a bacciferous herb, with esculent roots, bearing winged leaves and a belled flower; and says, that, according to his information, which is allowed to be very right in this respect, it was first brought from Virginia, by Sir Walter Raleigh, who, stopping at Ireland, about the year 1623, gave away a number of these roots, which were planted there, and multiplied so exceedingly, that, in the wars which happened afterwards in that country, when all the corn above ground was destroyed, potatoes became the chief support of the people: for the soldiers, unless they had dug up all the ground where they grew, and almost sifted it, could not have extirpated them. The Philosophical Transactions observe likewise, that the Irish were relieved from their last severe famine, which lasted two years, during which all their corn failed, merely by the help of this root. From Ireland it was brought to Lancashire, now famous for its potatoes: and the culture of this plant has, within these last thirty years, been extended to almost every part of England. The rich, who, at first, deemed them fit for none but the meaner sort of people, now esteem them so much, that Mr. Miller thinks the quantity of them which is cultivated around London only, exceeds that of any other part of Europe.

The red rooted potatoes have purplish flowers, and the white rooted (for Mr. Miller distinguishes only these two general varieties) bear white flowers.

The potatoe seldom perfects its seeds in England; and if it did, the raising of it from them would be much more tedious and uncertain than propagating it by its roots, as is the general and right method: for these multiply exceedingly, and may be made to yield vast crops, with little cost or labour.

"The Irish husbandman, says Mr. Switzer, after blaming the English for planting this root uncut, because it often contains five or six eyes, or perhaps more, from which the produce of the ensuing year is to spring; and also for not allowing that bulb, or rather the great number of shoots and bulbs that proceed from it, a space of earth sufficient for their nourishment, which is the reason why so many poor, stinted, unserviceable potatoes are dug up in the autumn, relates the practice of his country, which is to chuse middle sized roots, for the largest are generally eaten, to single out the eyes that seem strongest and most vigorous, and to cut them out in squares of at least half an inch every way: so that one root will sometimes furnish three or four good pieces to set.

"The ground, prepared for planting, is marked out for beds four or five feet wide, with intermediate alleys of two or three feet. It is then trenched, only a single spit deep, and the bottom of this trench, made as in common garden-trenching, is covered with dung, long and short, taken out of a wheel-barrow which stands at the labourer's elbow. The potatoe-eyes cut as before directed, are placed upon this dung, at about five or six inches asunder; and this trench is filled up with the mould taken out of the next, which is marked by a line at the distance of two or three feet. This trench is again filled with the mould of the next, and so on to the last, which is filled from the alley.

"The use of the dung thus laid at the bottom of the trenches, is not only to make the roots grow single, for not above one root, or at most two, will in this case be produced by each eye, and these will be large and well fed; but it is attended with the farther advantage of making the potatoes run, and spread themselves to a certain determinate depth, which is no small help to their growing large.

"The last thing to be done to them is, in April or May (for they are planted in February or March,) as soon as they begin to rise, to dig the earth out of the alleys, as is done for asparagus, and to cover the potatoe bed with it, about five or six inches thick. This will give new life and vigour to the roots, will keep the green from running too much to haulm, and will make the bulbs grow much the larger. By this means the crop of fine large potatoes will be almost the double of what is obtained when they are planted promiscuously in the common way: nor will any farther culture be requisite till they are fit to be dug up; except the pulling out of some of the largest weeds."

Mr. Miller's reasons for disapproving of the planting, either of the small offsets entire, or the eyes cut out of larger roots, are, that though the former generally produce a greater number of roots, these roots are always small; and that the cuttings of the larger roots are apt to rot, especially if wet weather happens soon after they are planted. He therefore recommends, to make choice of the fairest roots for setting, and to allow them a larger space of ground, both between the rows, and between the plants in the rows; and he assures us that he has observed, when this method has been followed, that the roots, in general, have been large the following autumn. M. Duhamel, in his Elements of Agriculture, does not object at all to the planting of the cuttings.

The soil in which this plant thrives best, is a light sandy loam, neither too dry nor over moist, but brought to a fine tilth, and ploughed very deep: for the deeper the earth is loosened, the finer and larger the roots will grow. In the spring, just before the last ploughing (according to Mr. Miller's method,) a good quantity of rotten dung should be spread on the ground, and this should be ploughed in early in March, if the season be mild; otherwise it had better be deferred until the middle or latter end of that month; for if a hard frost should come on soon after the roots are planted, they may be greatly injured, if not destroyed, thereby; but if they can be planted in the spring, without that danger, the better it will be.

The last ploughing should lay the ground even, and then furrows should be drawn three feet asunder, and seven or eight inches deep. The roots should be laid at the bottom of these furrows, about a foot and a half asunder, and they should then be covered in with earth.

After all the ground intended for potatoes is planted in this manner, it must remain in the same state till near the time when the shoots are expected to appear: then it should be well harrowed both ways, as well to loosen the surface and render it smooth, as to tear up the young weeds which will have begun to grow by that time. If much wet has fallen after the planting, it may have caked the surface of the earth, so as to retard the sprouting of the plants; and this harrowing will, in such case, almost answer the intent of a first hoeing.

I have placed the rows of potatoes at three feet distance, continues Mr. Miller, in order to introduce the hoe-plough between them; because that will greatly improve their roots: for by twice stirring and breaking of the ground between these plants, not only weeds will be destroyed, but the soil will be so loosened, that every shower of rain will penetrate to the roots, and greatly quicken their growth. But these operations should be performed early in the season, before the stems or branches of the plants begin to fall and trail upon the ground: for after that, it cannot be done without injuring the shoots.

If these hoe-ploughings are carefully performed, they will prevent the growth of weeds, till the haulm of the plants cover the ground; and after that there will be little danger of their growing so as to injure the crop; for the haulm will keep them under: but as the horse-hoe can only go between the rows, it will be necessary to make use of a hand-hoe to stir the ground, and destroy the weeds in the rows, between the plants. If this is well done, in dry weather, immediately after each of the two horse-hoeings, it will be sufficient to keep the ground clean until the potatoes are fit to be taken up; which will be, very soon after the first frost in the autumn has killed the haulm. They should not remain much longer in the earth, lest the roots themselves be frost-bitten, which spoils them. A four or five pronged fork is better to dig them up with, than a spade, because it is less apt to cut them: but a principal thing to be considered here, is the clearing of the ground thoroughly of them: for if any are left, they will shoot up among the next crop, whatever it be, and do considerable damage, especially if it be wheat, as is generally the case, sown in the common broad-cast way.

The best way of keeping these roots during the winter, is to lay them up in a dry place in very dry sand, or in fine and perfectly dry earth.

The method of laying dung only at the bottom of the furrows in which the roots are planted, " is a very poor one, says Mr. Miller, because, where the potatoes begin to push out their roots, they are soon extended beyond the width of these furrows, and the new roots are commonly formed at a distance from the old: so will be out of the reach of this dung, and consequently will receive little benefit from it." But rather the contrary would seem to be the case, according to the Irish husbandman, who, seems to speak from experience, when he says, he had intended expressly to answer this very objection, that " the dung is placed at the bottom of the furrows on purpose to make the roots grow single; and that its being so placed is attended with the farther conveniency of making the potatoes run, and spread themselves at a certain determinate depth, which is no small help to their growing large." Facts must here determine which is right: as they also must in regard to some parts of what Mr. Miller adds in the following words. " As most farmers covet to have a crop of wheat after the potatoes are taken off the ground, so the land will not be so thoroughly dressed in every part, nor so proper for this crop, as when the dung is equally spread, and plowed in all over the land, nor will the crops of potatoes be so good. I have always observed, where this method of planting the potatoes has been practised, the land has produced a fine crop of wheat afterward, and there has scarce one shoot of the potatoe appeared among the wheat, which I attribute to the farmers planting only the largest roots: for when they have forked them out of the ground the following autumn, there have been six, eight, or ten large roots produced from each, and often many more, and scarce any very small roots; whereas, in such places where the small roots have been planted, there has been a vast number of very small roots produced, many of which were so small, as not to be discovered when the roots were taken up; so have grown the following season, and have greatly injured whatever crop was on the ground."

Will not a thorough plowing and good harrowing, after the crop of potatoes has been taken off the ground, intermix the dung laid in the furrows, and the contiguous earth most impregnated thereby, with the rest of the soil; perhaps almost as well as if the dung had been spread equally over the whole field, at the very first? If it will, the presumption seems strong in favour of the Irish method. For certain it is, that the land ought to be well plowed and harrowed after the potatoes are removed, before it is sown with any other crop; unless the seed for that crop, which generally is wheat, be sprinkled by hand between the rows, as they are dug up, and there covered with the earth then turned over. This is practised in some parts of France: but, as M. Duhamel observes, the grain is so apt to be distributed unequally in this method, that it is better to plow the ground, and sow it, in the regular way.

If the farmer apprehends that his land has not been thoroughly cleared of the potatoes, and is therefore afraid of their damaging his ensuing crop; his best way will be to lay it up very rough against winter; because the frosts of that season are known to kill and rot all potatoes in the ground exposed to them, and it will at the same time be thereby finely prepared for spring corn; especially as it will have been well enriched by the haulm of the potatoes lying upon it.

Though potatoes delight most in a light sandy loam, neither too dry, nor over moist, as was observed before; yet Mr. Maxwell says he has seen them thrive well on ground that seemed to be very bad; even in deep moss, which could not bear horses to plow it, but which is considerably bettered by them; and on coarse heath, where they were succeeded by grain, without more dung than was laid on at first. Of so improving a nature are they, and so much is the land enriched by the rotting of their stalks among it, and the digging it gets in raising them.

Several experiments communicated to M. Duhamel concur to prove the extraordinary increase of potatoes cultivated with the horse-hoe: but as this will always be the consequence of the new husbandry, wherever it is properly used, I shall only borrow from him, on this occasion, M. de Villier's account of his method of practice, because it is the clearest and most concise.

" There are, says he, several sorts of potatoes. That which I cultivate is the middle sized. It is planted about the end of April, or the beginning of May, and it ripens in October. My beds are five feet wide. I give them two plowings in the spring; at the second of which I half fill the main furrow. Before I plant, I cut a small furrow with the single cultivator, which likewise loosens the earth; but if it be moist, I put a double spring-tree bar to the cultivator, to avoid the poaching of the horses. I then plant the potatoes a foot asunder in the row; choosing for this purpose such as are about the size of a walnut. They are thrust in by hand, two or three inches deep; and if the mould does not then cover them

sufficiently

ſufficiently of its own accord, a little more is puſhed down upon them.

"A ſlight hand-hoeing can hardly be avoided afterwards, to deſtroy the weeds which ſpring up at the ſame time as the potatoes: but this hoeing need not extend farther than three or four inches on each ſide of the row; becauſe the plow will do the reſt.

"I give the firſt hoe-plowing in the ſpring, as for wheat; but earlier or later, according to the condition of the ground.

"My ſecond hoe-plowing is given as ſoon as the plants are tall enough to be earthed up; that is to ſay, when they are eight or ten inches high. I then turn the earth up towards them as much as poſſible.

"As this plant ſpreads greatly, and ſhoots out very faſt, it would be impoſſible to give more than two of theſe hoeings, if one ſhould neglect to take advantage of the time when its leaves and branches do not entirely cover the bed.

"The roots are dug up in October or perhaps ſomewhat earlier or later, according to the ſeaſon, with a ſtrong iron prong; ſhaking and clearing them well from the mould. They are then left to dry for ſome hours, and are afterwards laid up in a place where the froſt cannot reach them.

"This fruit, which yields ſurpriſingly, is of great ſervice to feed and fatten cattle, eſpecially when it has been boiled a little. They like it very well raw, after it has been kept a few months above ground: but it is beſt for them after it has been boiled."

The reader is obliged to the ingenious Mr. Irwin for the following account of cultivating potatoes in Ireland, and which we ſhall give in his own words.

"The potato, ſays he, is become a root of ſuch immenſe utility, eſpecially to the poorer ſort, within this century, that too much, methinks, cannot be ſaid towards improving, and extending the culture of it.

"In Provence, Dauphiny, Switzerland, and ſeveral other parts of Europe, and even in America, it yields commodious, abundant relief to the more indigent, as being eaſily and plenteouſly propagated in almoſt every kind of ſoil.

"In Ireland particularly it is the principal food of the poor during the greater part of the year, without which, ſince the late unproportionable riſe of lands in that kingdom, to the trade of it, they could not well ſubſiſt. And, indeed, it ſeems a particular favour of providence ſent to them on this account.

"In times, not very remote, lands were cheap there, and the peaſantry, conſequently, lived on nouriſhment ſomewhat more luxurious, and diverſified: their labour alſo was leſs burthenſome. But now, being obliged to work hard at four-pence and ſix-pence a day, and their rents conſiderably augmented, it will not ſeem ſurpriſing that this root alone has become the ſtaple of their ſupport, and that they have been the firſt people in Europe, or, perhaps, in the world, that have led the example in an extenſive improvement of it. This may naturally be ſuppoſed to ariſe from cloſe-preſſing neceſſity, the moſt cogent and inſpiriting of all motives.

"In truth with much reaſon; for a poor labourer, in that ill-fated country, is driven to ſeek his ſole refuge for ſubſiſtence in this root, from the inexorable impoſition of a hard-hearted landlord, (ſorry I am to have it to ſay, too many of them grind the poor; but hope it will not be long the caſe) who thinks he cannot get too much for his land out of the perſons, or purſes, of his dependents, and who hath ſo inverted the old cuſtoms, that a hewer of wood, and drawer of water, (and many of theſe perhaps deſcendants of former proprietors) can afford himſelf but a miſerable ſcanty platter of potatoes, ſeaſoned with a palatable grain of ſalt, and waſhed down with a draught from the next rivulet, to ſupport the fatigue of thirteen hours (ſtatute quantity) of unceaſing labour, about his ancient manſion-houſe, or in his elegant gardens, well-laid-out cloſes, or refreſhing bog-holes.

"The potato is a root, a little of which is very filling, quickly appeaſing hunger; but by no means a laſting ſolid nouriſhment for a labourer, as evidently teſtify the ſqualid looks of numbers of the poorer Iriſh; though at the ſame time it is in general whole ſome, agreeing with moſt ſtomachs that can vary their food; but, like other productions of the earth, forbid in many caſes by the medicinal tribe.

"There are ſeveral ways of breeding potatoes in Ireland, which partly ariſe from the difference in ſoil, and kinds of ſeed. The different ſoils for this purpoſe in uſe in my neighbourhood, for about twenty years paſt, and which, I believe, are pretty general, are the following, wherein they are abundantly propagated, viz.

"Firſt, On rich clay land without any manure, vulgarly called graſs potatoes.

"When a leaſe is near being expired, that is, during the laſt ſeven years of it, if there be no covenants grounded on the ſtatute againſt waſte, &c. the tenant, finding no hopes of a renewal, ſets conſiderable tracts in this way, where the ſoil will admit of it.

"Secondly, On good ley land well gravelled, (otherwiſe ſanded) which ought to be done a year before planting. But the poorer ſort, who are the chief cultivators of this root, are obliged to ſand and plant at the ſame time, or nearly thereabouts; which is very deſtructive to themſelves, their potatoes not having the proper benefit of the manure; at leaſt one part in three of the return are on this account exceeding ſmall, and are from hence called poreens by them, being a diminutive expreſſion. Whole fields are ſet in this way, (commonly called ſpaddane, in which a conſiderable trade is driven; eſpecially in the provinces of Munſter and Connaught.

"Had it been properly and moderately done, it would be a fine preparation for the encreaſe of corn, and the laying down and bringing in, or, in other terms, the reclaiming of land; but the poor do it ſo negligently, and mangle it ſo intolerably, having but a ſhort temporary uſe in it, beſides paying near double the worth for it, that this manufacture, which might otherwiſe be of conſiderable benefit to Ireland, is, as now carried on, rather the contrary.

"Thirdly, On ground previouſly gravelled (that is, perhaps ſix months before) and dunged at ſetting time. There is but little done in this way, except by the gentry, and renters of land for their private uſe; it being as yet out of reach of the peaſantry, unleſs in a few inſtances.

"Fourthly, On the ley with dung alone. Marle is not in uſe in my neighbourhood, though there is plenty of it in ſeveral parts of it; therefore cannot yet inform you how it would do for the potatoes in that diſtrict. As to potatoes ſet in the ley with dung alone, this manufacture alſo is done, as you may judge, moſtly by the more opulent. I have, however, often ſeen large fields ſet in this way to the public; but it is not of late years ſo much the cuſtom, this ſort of land being commonly kept for grazing: this hurts the land; and any preparation out of the ley for potatoes will, if not previouſly gravelled.

"Fifthly, In arable or ſtubble land (vulgarly called ſticking or thruſting of potatoes, becauſe they are ſown with a ſtick, pointed at the end, about an inch diameter and two feet long, with the loy (otherwiſe the Iriſh ſpade.) In this method dung is alſo uſed, which ſhall be noticed in loco.

"Theſe are the moſt general methods that now occur to me, or I believe that are in uſe. There are, however, ſome others ariſing from the quality of the ſeed, practiſed only by the curious, in which the plants are put down at nine or twelve inches aſunder every way, in little hillocks, (like the hop plant) as practiſed in ſeveral counties in England; and, if you land them at certain proper ſtated times while vegetation continues, you will have a handſome neſt of large oblong potatoes at every landing.

"I made the experiment of one ſort in my garden; and out of half a dozen potatoes cut into ſeveral pieces, each having an eye, I had, to the beſt of my remembrance, without exaggeration, a quantity nearly equal to twelve Wincheſter buſhels.

"This kind of potato is introduced into Ireland but of late years: it is however well known there.

"A potato entirely black is alſo in uſe in Fingal, near Dublin, fructifies abundantly, and eats exceeding dry, which principally marks the goodneſs of this root in almoſt every inſtance.

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"There

" There are ſeveral kinds of potatoes. Mr. Maxwell, of Arkland in Scotland, a very judicious gentleman, has particularly noticed ſix ſorts, viz. The long red, the round red; the long white, the round white, or Spaniſh potato; the blue, the leather-coat, and an early kind that comes in a month ſooner than the common ſort, though planted at the ſame time.

" This root being greatly manufactured in Ireland, they mix moſt of the better ſorts promiſcuouſly, both for uſe and ſeed.

" I remember, about twenty-five years ago, the large red potato, then called the Caſtonian, (perhaps from Caſtile) as alſo the oblong Spaniſh white potato, to be chiefly in uſe; but now a leſſer ſort, ſuch as the Munſter or kidney potato, of a whitiſh or lightiſh yellow colour, the leather-coat, or round red Cronian potato, with a rough thick ſkin, and particularly that ſtiled the Spaniſh white potato, are moſtly in uſe.

" All theſe ſorts are cut for ſeed, according to the number of eyes on them, and thrive generally well with very little care; ſo that all ſorts being now ſo plenty, and anſwering ſo well, there are (as we may eaſily judge) no over nice diſtinction made about them there. The poorer Iriſh, who affect not to plant this root in bottom lands, or wet ſwampy grounds, unleſs hard preſſed for ſoil, are even in this caſe ſeldom attentive about the kind of potato they put down, the return being commonly wet, unfit for eating, and only proper for ſeed, which (from my little experience) I think makes but indifferent, though ſown in the beſt prepared upland; for too much moiſture, as well as too much dung, makes a potato wet: and plant it when you will, I am apprehenſive it never loſes this quality, which is the worſt it can have, except being rotten, or froſt-bit: nor will any eat ſo well, raiſed from dung, as without.

" As the potato thrives in different ſoils, ſo there are different methods of cultivating it: I will therefore now proceed to that moſt generally in uſe in my neighbourhood, (and indeed all over the kingdom) called graſs potatoes or ſpuddane, and by ſome (improperly) conacres, which ſeems to be the natural culture, but doubtleſs not ſo good to make the land ſtand long proof, (notwithſtanding the graveling) as if artificial manures were added, ſuch as dung, compoſt, lime, &c. for marle, lime-ſtone, gravel, ſea-ſand, ſhells, &c. I conſider in the claſs of natural manures and the beſt; and providence hath kindly given them in every ſpot, (even in the unpromiſing deſerts of Zara, &c.) had we known how to come at them.

" Land in the ley, (as I ſaid before) and that which requires no manure, the Iriſh ſeek moſt greedily after; ſome of which has not been ploughed perhaps within this century: ſo that you can only juſt diſtinguiſh that it has been tilled, and the tilth generally curved, the old people inclining the plough with the caſual ſhape of the field, ſo as to let the water in the furrow have a drip or fall.

" When a peaſant has the good luck to get a bit of ſuch choice ground, (for two or three of them will be concerned in an acre, and few take more than one) he follows the old ridge with his *loy*, or Iriſh ſpade, unleſs compelled by the poſſeſſor of the land to make his ridges ſtraight, which he moſt unwillingly does, and at beſt but aukwardly, with a rope made of hay or ſtraw, or ſome of his wife's worſt tow; neither of which ſtretching right, and often breaking, ſeldom admit well-looking ridges: theſe he makes from one end of his ground to the other, the beds being about three, or at moſt four feet wide, and the furrows, or trenches, about two. When he depoſits the ſeed on his bed, at about four or ſix inches at moſt aſunder, he divides the turf of his furrow in two equal parts, which he turns alternately in ſods on the edge or verge of each bed, the green ſide on the potatoes, cutting the ſods on three ſides or angles, leaving that next the bed uncut. This laborious work the poor fellow does ſurprizingly quick: two more men follow him, one digging the under ſtratum, and throwing up on the middle of the bed as much of the earth as he conveniently can with his *loy*: the remainder the third man caſts on with his ſhovel, ſettling the bed in the form, or manner, in which it is to remain.

" Some cover their potatoes at firſt (through want of time) with only the ſod, and about four or five inches of earth, and finiſh them perhaps, that is, caſt the laſt covering on them, not for a month, or ſix weeks after; which poſſibly may greatly check their growth. Many account this the beſt way, and it is become common; but I attribute the neglect of not finiſhing their potatoes, (as the term is) in due time, to no want of proper knowledge in the common Iriſh, but their inability to give the proper attention to their own little affairs, occaſioned by the greedy ſeverity of their maſters, as before obſerved.

" Others there are (and many) who, making the furrows unproportionably narrow to the beds, throw up a third ſpit or ſtratum, and perhaps not until two months after the firſt ſetting.

" This pernicious method may poſſibly deſtroy, or check the weeds; but certain I am, it will not contribute to the increaſe or largeneſs of the root, in the unphyſical or over heavy manner in which I have ſeen it done; becauſe this lower ſtratum, which is moſtly ſand, remains on the top of the richeſt part of the ſoil, and being thus unmixed with it, prevents it from receiving the proper benefits of the air, &c. beſides, too great a covering on the potato is highly prejudicial to it.

" In other caſes, theſe ſtratums thrown up, and mixed into a good tilth, would anſwer wonderfully, mixing well, being the life of good tillage. I would therefore in this place recommend to our farmers (who are too penurious of their land) to make their potato trenches ſo wide, as not to require throwing up much of the third or ſandy ſtratum on the laſt covering, or landing, of their potatoes: and they will find a much greater return, and one half (or more) leſs of *poreens*, or ſmall potatoes: which is an object highly worthy of their notice. The experiments I have made, I purpoſe repeating on my return to Ireland, and hope to prove this ſimple method to exceed that in the hillock, or in the drill way.

" In this manner all ley land is ſown with potatoes by the common people, and moſt others, whether manured or not. If dunged, the dung is laid out as the ridges are to be, but the ſand is ſpread all over the ſurface. Commonly little boys and girls precede the ſetters on the ridges, laying down the ſeedlings or potato eyes, which they do very quick, and tolerably well, at the appointed diſtance. This ſeems a giddy part of the buſineſs, and well ſuited to their years; but cuſtom makes them perfect in it.

" The next general method is planting potatoes in ſtubble ground, which is, in the common way above-mentioned, by dunging it well, and ſometimes by ploughing it in, and then ſhovelling up the ridges, a man going before, lightly digging them, that there may be a ſufficient quantity of mould to cover them; but this the poorer ſort cannot well compaſs to do, and always avoid it when they can get a freſh or ley ſurface.

" Nor do they ſow them to chuſe, the ſecond year, in the ſame ground, without dung or ſome other artificial manure, (for the natural, ſuch as ſand, marle, &c. would not do) unleſs it be exceeding good.

" Lime, indeed, in this caſe would very probably anſwer, but it is rarely tried.

" There is alſo a cuſtom a good deal in uſe, which is by ſticking or thruſting potatoes in ſtubble land freſh ploughed, which is done in this manner: a man (but ſeldom two) goes on the crown of a narrow ploughed ſet, and ſticks his *loy*, or *Iriſh ſpade*, in it, every here and there, with his right foot, holding it in his left hand, and with it puſhing the ſpade once, and ſometimes twice from him, to make an opening, (which I have ſeen done with a good deal of dexterity) and with the right hand, that contains the ſeed, (a convenient quantity of which he carries in an apron, or cloth, tied round his middle, ſo as to let the contents be eaſily come at) he throws one, and ſometimes two ſets, or eyes, into the opening which the *loy* makes behind; and on his drawing it away, the looſened earth falls in and covers them. Soon after he dungs the ridges, and covers them up, as in the preceding method, with mould out of the furrows.

" Sometimes alſo they do this work with a ſtick about eighteen inches long, and an inch or ſo diameter, pointed at one end, and ſomewhat curved at the other. By this eafy means hufband, wife, children, and fervants, (if they have any) and a friendly neighbour or two, (who may be helped in return) affift at it for greater expedition, efpecially when the feafon happens to be advanced.

" In Scotland they do this work fomewhat differently.

" In Ireland alfo there are many, who fow potatoes after the plough, the ploughman letting the fets drop in as he goes along; and a harrow matched to the fame plough, following him clofe behind, covers them in. There is no great difficulty in this, the land being in tilth. Over all they put dung; but they fhould mind to give it a light covering, that the fubftance of it might impregnate with the adjacent earth, which it would not do, but evaporate by being left expofed to the air, &c. yet this precaution many are very negligent in.

" The other methods, as in the drill, or hillock, or horfe-hoeing way, &c. are little ufed there, except among the more curious; but they being well known in England, it is needlefs to mention them in this place.

" The next thing requifite is the fencing, which fhould be done, at fartheft, before the ftalk begins to appear; for, if the cattle, that are in that feafon greedy for frefh vegetables, get at them, the roots of fuch as they nip will never come to the fize they otherwife would.

" This is well known in Ireland; and yet the poor, chiefly I believe from inability, and partly from a fort of careleffnefs, or rather lazinefs, they ftill inherit (notwithftanding the mixture of Englifh and Norman blood, &c.) from their Spanifh anceftors, are very remifs in this refpect; efpecially in the chiltern, or more fertile parts of the country; where, in moft matters of hufbandry, they leave too much to chance, relying on the bounty of the foil.

" About me, and in many other parts, they very commonly do not put on the firft covering till about the middle of May; and the fecond, perhaps, not for a month after; fo that it is often July before they fence them properly: and where many of them are concerned in a plantation (as is ufually the way) it is moft troublefome and difficult to get each man to do his part of the ditching, which commonly is but a forry mound of fods, with fome bufhes fodded down on top, to keep out fheep, that fmell this plant when it rifes (as cattle do corn) and are very dexterous in getting at it.

" Some of thefe poor people are fo heedlefs, they never can be brought to make their fences; and then the owner of the ground, in his own defence, is obliged to get it done at an advanced price, and they to pay for it, or their potatoes to remain.

" Many of them, efpecially in cheap years, leave them on the landlord's hands; and, unlefs a farmer collects himfelf, or has a good fervant to do it, the rent is not had without immenfe trouble, and fome of it never. Notwithftanding thefe difficulties, many farmers have made eafy fortunes in this way.

" Thus it happens, at the time they are often finifhing the fencing, they ought to be weeding their potatoes. The weed that moftly annoys them is the Scotch thiftle: this fhould be cut away in June, and if the foil fhould be fo rich as to require a fecond weeding (which is very often the cafe) it fhould be done in Auguft. There will be no other trouble with them till digging time.

" The beft time for this work is in the latter end of October, or beginning of November, to avoid the early frofts, which are mortal to them: but if, by bad hufbandry, they have been planted late, they fhould be left longer in the ground, and covered with litter, or haulm, to prevent being loft in this way.

" About Michaelmas the cattle are let through them, the roots not being then affected by the nipping, or beating down, of the ftalk: this the peafants know by the colour of it, which becomes a dark brown, lofing its verdure; as alfo by the apple and root.

" The more needy begin to dig them for ufe in Auguft, though they are not then near fo long in ground as they are in England; which demonftrates the excellence and ftrength of the Irifh foil.

" When gentlemen farmers dig their potatoes, they fet on a great number of hands at once, two to a ridge: boys and girls gather them promifcuoufly, big and little, into bags containing about two Winchefter bufhels; and thus they are carried to the farm-houfe, and thrown into a room, in one heap, part of which is deftroyed by the froft, a great part by the kitchen, alfo by the hogs, who deftroy them much while in ground, there being hardly any fencing againft them; a great part are alfo ftole by the followers, or hangers-on; and the remainder rarely fuffices for feed, of fo little value is this eftimable root confidered in thofe parts: and yet I have often known them at a very high price, from ten to twenty fhillings, and upwards, the big barrel, which is the ufual meafure in the weftern parts of Ireland; that is, above two barrels, or eight bufhels, Winchefter meafure.

" Had they fuch places as Covent-Garden near them, the cafe would be far different: but where there are no convenient and brifk markets, the wafte in farms is always great.

" Though, as I remarked before, low or fwampy grounds do not anfwer well for potatoes, yet they fometimes thrive, and are large, the meat being generally fcabby, clofe, wet, and heavy, from the too great impregnation of the water, which renders them unpalatable, and not the beft for feed; however, fuch are chiefly ufed in this way: yet I have feen them planted in red bogs, which are the wetteft and worft; and the bog being previoufly fanded and dunged, the ftalk looked green and healthy, and fome of the roots might perchance have eat dry; but thofe planted in black, or drier bogs, have been found to fucceed well.

" There is no culture perhaps, yet known, will better reclaim wafte and unprofitable lands, than that of the potato. Ireland can well prove the truth of this affertion in a numberlefs variety of inftances.

" I have feen feveral tracts of woodland ftubbed up, and brought into fine tilth, by means of the potato hufbandry. America, I believe, can fay the fame.

" Of late years the hard-hearted fky-farmers, that is, the inferior fort, and even fome of our gentlemen-farmers, drive the poor into the mountains, moory grounds, wooded and ftony lands, and even into the bogs; and when, by the culture of the potato principally, they have reclaimed them, fo as to be fit to admit cattle, they are turned out without ceremony. I have in fuch places feen as fine crops of potatoes, and afterwards flax, and different kinds of corn, as ever I met with any where.

" The mountain and other furfaces, except bog, feldom fail being bleffed by nature with lime-ftone, gravel, (which is the commoneft) or fome other manure, adapted to them; fo that it is nothing but hands, money, and a proper limitation of the grazing-farming, that are wanting to make almoft the whole kingdom look like a garden, or like England; I need go no higher with the comparifon.

" It is true, in fome few counties of Ireland, in particular diftricts, nature either has not been fo bountiful, or the farmers have not found out the internal manures; being obliged to carry fea-fand, and other forts, many miles; in which however they find their account, notwithftanding the impolitically too much limited trade of the kingdom.

" Before I difmifs this fubject, it may be proper to obferve, that a fecond crop of potatoes is fometimes taken out of the fame land fucceffively; but this is not common, at leaft about me, though I believe the land is as good as any in the province. On the contrary, the ufual way is, after the firft crop of potatoes is taken off, if the foil is ftrong, they immediately fow bere in it, or keep it till the following fpring for flax, which requires an equally ftrong foil: or if the ground be but of a middling good fort, they fow it, juft after the potatoes are taken out, with wheat; or keep it till the April following for barley.

" The fky-farmer generally takes the land into his own hands after the firft crop of potatoes, and fows it with bere, wheat, or barley, for two or three feafons; after which, if he refrefhes it with a fummer, or a winter fallow, he fows the faid kinds of grain in it for two or three feafons more; then he takes two or three crops of oats; and when it is well impoverifhed, or drawn (as they call it there) he lets it for feveral years together, in con-acres, to the poor people, for at leaft one third more than the real value.

" From hence we may judge how much an alteration of method in hufbandry is wanting in thofe parts."

Mr.

Mr. Irwin is certainly right in ſaying, that lime would very probably anſwer; for in the Iſle of Man, though they are no farmers, yet they cultivate exceeding fine potatoes, as they are their principal food.

Some bring in different ſorts of land by the means of them: in moory ground, after the heath is burnt off it, they mark out the beds, upon which they ſpread out the lime in near about the ſame quantity that is required in liming ground, or rather more; upon which they lay the ſeed in the uſual manner, and, after cutting the turf in the furrow, lay it on the verge of the bed with the heathy ſide undermoſt, and cover them over with the mould out of the furrow in the common method.

After coming up, they weed, or give them a ſlight covering, to keep down the weeds.

When they raiſe them, it takes a little more labour; yet while they are digging a crop of very fine dry potatoes, they are gaining a piece of ground, which was before uſeleſs, and making it fit for ploughing and bearing corn the year following.

Lime is found alſo to be of excellent ſervice to potatoes in cold ſour land, which they manage after the ſame manner, and reap potatoes greatly excelling thoſe without lime, on the ſame ground.

Lime is certainly a very fine manure for potatoes: they uſe it in the iſle above-mentioned, without any other thing, on all ſorts of land, even upon a light, rich, limeſtone ſoil; and it betters the quality of the potatoe ſurpriſingly: beſides fermenting and meliorating the ſoil, it has the property of attracting and abſorbing any cold ſour matter which may be prejudicial to vegetation.

About Caſtletown, in the ſame iſle, they take a great deal of care in their culture of potatoes, and their product pays them very well for their trouble.

After marking out the bed with their ſpade, and ſpreading on the dung, or lime, they begin at one end, and dig acroſs the bed, making it a ſpadeful, all along, higher than the neighbouring ground.

Then they dig and caſt the mould out of the furrows upon the bed, in the common method; and after finiſhing it, they, with a kind of dibble, or ſhaft of a ſpade ſhod with iron, ſome round and ſharp, others ſquare, about three or four inches broad, plant in the ſeed, about ſix or more inches diſtance one from another; and when they come up above ground, they weed them as clean as a garden, and after they are ſtronger and higher, with a hoe earth up the mould about the ſtalks; by which they kill the weeds, and have exceeding fine potatoes.

PREGNANT, teeming, breeding, fruitful.

PRICKING, a term uſed by farriers, &c. to ſignify the driving a nail into the ſoft part of a horſe's foot.

If a lameneſs proceeds from pricking in ſhoeing, the foot ſhould be pared thin on the wound ſide; and after dreſſing with tar and turpentine, let it be ſtopped with two ounces of common turpentine, melted down with four of lard.

If the nail penetrates to the joint of the foot, where matter may be formed, and by its long continuance putrify, ſo as to erode the cartilages of the joint, the caſe is incurable.

If the nail has paſſed up to the nut-bone, it is incurable, becauſe this little bone cannot exfoliate; and becauſe the cartilaginous part of it is deſtroyed, as ſoon as injured.

If the nail has not paſſed to the tendon, the horſe will do well, without a neceſſity for drawing the ſole; but if the tendon is wounded, the ſole muſt be carefully drawn, becauſe a ſinovia and gleet is diſcharged.

When gravel is the cauſe, it for the moſt part follows the nail-holes, and if it gets to the quick, cannot return, unleſs it is ſcraped out; for the make of the hoof, which is ſpiral like an ear of corn, favours its aſcent, ſo that the gravel continues working upwards towards the coronet, and forms, what the farriers call a quittor-bone.

The nature of this diſorder points out the method of cure, which is to be as expeditious and careful as poſſible, in getting out the gravel: if it is found difficult to effect this let the ſole or hoof be pared thin, and if neceſſary, the wound inlarged to the bottom, and then dreſſed up as uſual. Should the coffin-bone be affected, remember always to bathe the hoof with vinegar, or repellers, in order to allay the heat and inflammation, which often happen on ſuch occaſions; and ſhould the pain and anguiſh affect the legs, treat them in the ſame manner, or charge the leg and paſtern with a mixture of wine lees and vinegar.

PRONG, an implement much uſed in huſbandry, conſiſting of two or three pieces of iron, inſerted into a handle, for taking up corn, ſtraw, dung, &c.

PRONG-*hoe*, a term uſed to expreſs an inſtrument uſed to hoe or break the ground near, and among the roots of plants.

The ordinary contrivance of the hoe in England is very bad, it being only made for ſcraping on the ſurface; but the great uſe of hoeing being to break and open the ground, beſides the killing the weeds, which the ancients, and many among us, have thought the only uſe of the hoe, this dull and blunt inſtrument is by no means calculated for the purpoſes it is to ſerve.

The prong-hoe conſiſts of two hooked points of ſix or ſeven inches long, and, when ſtruck into the ground, will ſtir and remove it the ſame depth as the plough does, and thus anſwer both the ends of cutting up the weeds and opening the land. The ancient Romans had an inſtrument of this kind, which they called the bidens; but they were afraid of its uſe in their fields and gardens, and only uſed it in their vineyards. The prong-hoe comes into excellent uſe, even in the horſe-hoeing huſbandry; in this the hoe-plough can only come within three or four inches of the rows of the corn, turneps, and the like; but this inſtrument may be uſed afterwards, and with it the land may be raiſed and ſtirred, even to the very ſtalk of the plant. *Tull's Huſbandry*

PROPAGATION, the continuance or diffuſion of ſucceſſive production.

The ingenious Mr. Barnes has given us the following method of propagating trees by the bud and branch.

"Every leaf, ſays he, upon the branch of a tree, or ſhrub, has uſually a young bud in its boſom; and it is certain each of theſe buds has in it the rudiment of a tree of the ſame kind: therefore it appeared reaſonable to think that every branch might afford as many new plants as there were leaves upon it; provided it were cut into ſo many pieces, and a proper dreſſing was found to prevent the raw ends of each piece from decay. The beſt mixture for this purpoſe, upon careful and repeated experience, I have found to be this.

"Melt together, in a large earthen veſſel, two pounds and a half of common pitch, and half a pound of turpentine. When they are melted, put in three quarters of an ounce of powder of aloes; ſtir them all together; and then ſet them on fire: when it has flamed a moment, cover it up cloſe, and it will go out: then melt it well, and fire it again in the ſame manner: this muſt be done three times. It muſt be in the open air, for it would fire a houſe; and there muſt be a cover for the veſſel ready. After it has burnt the laſt time, melt it again, and put in three ounces of yellow wax ſhred very thin, and ſix drachms of maſtich in powder. Let it all melt together till it is perfectly well mixed; then ſtrain it through a coarſe cloth in a pan, and ſet it by to cool.

"When this is to be uſed, a piece of it muſt be broke off, and ſet over a very gentle fire; it muſt ſtand till it is juſt ſoft enough to ſpread upon the part of the cutting where it is wanted; but it muſt not be very hot. It is the quality of this dreſſing, to keep out wet intirely: the part which is covered with it will never decay while there is any principle of life in the reſt; and, this being ſecured, nature will do the buſineſs of the growing.

"This I have found true in practice; and by repeated trials, in more kinds than one, I have found that I could raiſe from any piece of a branch as many good plants as there were leaves upon it."

PRUNIFEROUS *trees*, thoſe which bear a pretty large and fleſhy fruit, with a nucleus in the middle.

PRUNING, the operation of lopping off the ſuperfluous branches of trees, in order to make them bear better fruit, grow higher, or appear more regular.

There is not any part of gardening, which is of more general uſe than that of pruning; and yet it is very rare to ſee fruit-trees ſkilfully managed: and almoſt every gardener will pretend to be a maſter of this buſineſs, though there are but few who rightly underſtand it; nor is it to be learned by rote, but requires a ſtrict obſervation of the different manners of growth of the ſeveral ſorts of fruit-trees; ſome requiring to be managed one way, and others muſt be treated in a quite different method, which is only to be known from carefully obſerving how each kind is naturally diſpoſed to produce its fruit: for ſome ſorts produce their fruit on the ſame year's wood, as vines; others produce their fruits, for the moſt part, upon the former year's wood, as peaches, nectarines, &c. and others upon curſons or ſpurs, which are produced upon wood of three, four, or five, to fifteen or twenty years old, as pears, plums, cherries, &c. therefore, in order to the right management of fruit-trees, there ſhould always be proviſion made to have a ſufficient quantity of bearing wood in every part of the trees, and, at the ſame time, there ſhould not be a ſuperfluity of uſeleſs branches, which would exhauſt the ſtrength of the trees, and cauſe them to decay in a few years.

The reaſons which have been laid down for pruning of fruit-trees, are as follow: firſt, to preſerve trees longer in a vigorous bearing ſtate; the ſecond is, to render the trees more beautiful to the eye; and, thirdly, to cauſe the fruit to be larger, and better taſted.

1. It preſerves a tree longer in an healthy bearing ſtate; for by pruning off all ſuperfluous branches, ſo that there are no more left upon the tree than are neceſſary, or than the roots can nouriſh properly, the root is not exhauſted in ſupplying uſeleſs branches, which muſt afterwards be cut out; whereby much of the ſap will be uſeleſsly expended.

2. By ſkilful pruning of a tree, it is rendered much more pleaſing to the eye: but here I would not be underſtood to be an advocate for a ſort of pruning which I have ſeen too much practiſed of late; viz. the drawing a regular line againſt the wall, according to the ſhape or figure they would reduce the tree to, and cutting all the branches, ſtrong or weak, exactly to the chalked line; the abſurdity of which practice will ſoon appear to every one who will be at the pains of obſerving the difference of thoſe branches ſhooting the ſucceeding ſpring. All therefore that I mean by rendering a tree beautiful, is, that the branches are all pruned according to their ſeveral ſtrengths, and are nailed at equal diſtances in proportion to the different ſizes of their leaves and fruit; and that no part of the wall, ſo far as the trees are advanced, be left unfurniſhed with bearing wood. A tree well managed, though it does not repreſent any regular figure, yet will appear very beautiful to the ſight, when it is thus dreſſed, and nailed to the wall.

3. It is of great advantage to the fruit; for the cutting away all uſeleſs branches, and ſhortening all the bearing ſhoots, according to the ſtrength of the tree, will render the tree more capable to nouriſh thoſe which are left remaining, ſo that the fruit will be much larger, and better taſted. And this is the advantage which thoſe trees againſt walls or eſpaliers have to ſuch as are ſtandards, and are permitted to grow as they are naturally inclined; for it is not their being trained either to a wall or eſpalier which renders their fruit ſo much better than ſtandards, but becauſe they have a leſs quantity of branches and fruit for their roots to nouriſh; and, conſequently, their fruit will be larger, and better taſted.

There are many perſons who ſuppoſe, that if their fruit-trees are but kept up to the wall or eſpalier, during the ſummer-ſeaſon, ſo as not to hang in very great diſorder, and, in winter, to get a gardener to prune them, it is ſufficient: but this is a very great miſtake; for the greateſt care ought to be employed about them in the ſpring, when the trees are in vigorous growth; which is the only proper ſeaſon to procure a quantity of good wood in the different parts of the tree, and to diſplace all uſeleſs branches, as ſoon as they are produced, whereby the vigour of the tree will be intirely diſtributed to ſuch branches only, as are deſigned to remain; which will render them ſtrong, and more capable to produce good fruit; whereas, if all the branches are permitted to remain, which are produced, ſome of the more vigorous will attract the greateſt ſhare of the ſap from the tree, whereby they will be too luxuriant for producing fruit, and the greateſt part of the other ſhoots will be ſtarved, and rendered ſo weak, as not to be able to produce any thing elſe but bloſſoms and leaves, as hath been before mentioned; ſo that it is impoſſible for a perſon, let him be ever ſo well ſkilled in fruit-trees, to reduce them into any tolerable order by winter pruning only, if they are wholly neglected in the ſpring.

There are others, who do not intirely neglect their trees during the ſummer ſeaſon, as thoſe before mentioned; but yet do little more good to them by what they call ſummer pruning; for theſe perſons neglect their trees at the proper ſeaſon, which is in April and May, when their ſhoots are produced, and only about Midſummer go over them, nailing in all their branches, except ſuch as are produced fore-right from the wall, which they cut out; and at the ſame time often ſhorten moſt of the other branches; all which is intirely wrong practice; for thoſe branches which are intended for bearing the ſucceeding year, ſhould not be ſhortened during the time of their growth, which will cauſe them to produce two lateral ſhoots from the eyes, below the place where they were ſtopped, which ſhoots will draw much of the ſtrength from the buds of the firſt ſhoot, whereby they are often flat, and do not produce their bloſſoms; and if thoſe two lateral ſhoots are not intirely cut away at the winter pruning, they will prove injurious to the tree, as the ſhoots which theſe produce will be what the French call water-ſhoots: and in ſuffering thoſe luxuriant ſhoots to remain upon the tree until Midſummer, before they are diſplaced, they will exhauſt a great ſhare of the nouriſhment from the other branches, as was before obſerved; and by ſhading the fruit all the ſpring-ſeaſon, when they are cut away, and the other branches faſtened to the wall, the fruit, by being ſo ſuddenly expoſed, will receive a very great check, which will cauſe their ſkins to grow tough, and thereby render them leſs delicate. This is to be chiefly underſtood of ſtone-fruit and grapes; but pears and apples, being much harder, ſuffer not ſo much, though it is a great diſadvantage to thoſe alſo, to be thus managed.

It muſt alſo be remarked, that peaches, nectarines, apricots, cherries, and plums, are always in the greateſt vigour, when they are the leaſt maimed by the knife; for, where theſe trees have large amputations, they are very ſubject to gum and decay; ſo that it is certainly the moſt prudent method carefully to rub off all uſeleſs buds when they are firſt produced, and pinch others, where new ſhoots are wanted to ſupply the vacancies of the wall; by which management trees may be ſo ordered, as to want but little of the knife in winter pruning, which is the ſureſt way to preſerve theſe trees healthful, and is performed with leſs trouble than the common method.

The management of pears and apples is much the ſame with theſe trees in ſummer; but in winter they muſt be very differently pruned: for, as peaches and nectarines do, for the moſt part, produce their fruit upon the former year's wood, and therefore muſt have their branches ſhortened according to their ſtrength, in order to produce new ſhoots for the ſucceeding year; ſo pears, apples, plums, and cherries, on the contrary, producing their fruit upon curſons or ſpurs, which come out of the wood of five, ſix, or ſeven years old, ſhould not be ſhortened, becauſe thereby thoſe buds which were naturally diſpoſed to form theſe curſons or ſpurs, would produce wood-branches, whereby the trees would be filled with wood, but never produce much fruit; and as it often happens, that the bloſſom-buds are firſt produced at the extremity of the laſt year's ſhoot, ſo, by ſhortening the branches, the bloſſoms are cut away, which ſhould always be carefully avoided.

There are ſeveral authors who have written on the ſubject of pruning in ſuch a prolix manner, that it is impoſſible for a learner to underſtand their meaning: theſe have deſcribed the ſeveral ſorts of branches, which are produced on fruit-trees; as wood-branches, fruit-branches, irregular branches, falſe branches, and luxuriant branches; all which they aſſert, every perſon who pretends to pruning, ſhould diſtinguiſh well: whereas there is nothing more in all this but a parcel of words to amuſe the reader, without any real meaning; for all theſe are comprehended under the deſcription already given of luxuriant or uſeleſs branches, and ſuch as are termed uſeful for fruit-bearing branches; and, where due care is taken in the ſpring of the year, to difplace thefe ufelefs branches, as was before directed, there will be no fuch thing as irregular, falfe, or luxuriant branches, at the winter pruning; therefore it is to no purpofe to amufe people with a cant of words, which, when fully underftood, fignify juft nothing at all.

The following hints will be of great ufe in pruning ftandard trees.

Firft, you fhould never fhorten the branches of thefe trees, unlefs it be where they are very luxuriant, and grow irregular on one fide of the tree, attracting a great part of the fap of the tree, whereby the other parts are unfurnifhed with branches, or are rendered very weak; in which cafe the branch fhould be fhortened down as low as is neceffary, in order to obtain more branches, to fill up the hollow of the tree: but this is only to be underftood of pears and apples, which will produce fhoots from wood of three, four, or more years old; whereas moft forts of ftone fruit will gum and decay, after fuch amputations.

But from hence I would not have it underftood, that I would direct the reducing of thefe trees into an exact fpherical figure, fince there is nothing more deteftable than to fee a tree, which fhould be permitted to grow as it is naturally difpofed, with its branches produced at proportionable diftances, according to the fize of the fruit, by endeavouring to make it exactly regular at its head, fo crouded with fmall weak branches as to prevent the air from paffing between them, which will render it incapable to produce fruit. All that I intend by this ftopping of luxuriant branches, is only when one or two fuch happen on a young tree, where they intirely draw all the fap from their weaker branches, and ftarve them: and then it is proper to ufe this method, which fhould be done in time, before they have exhaufted the roots too much.

Whenever this happens to ftone fruit, which fuffer much more by cutting than the former forts, it fhould be remedied by ftopping or pinching thofe fruits in the fpring, before they have obtained too much vigour; which will caufe them to pufh out fide branches, whereby the fap will be diverted from afcending too faft to the leading branch, as hath been directed for wall-trees; but this muft be done with caution, as before.

You muft alfo cut out all dead or decaying branches, which caufe their head to look very ragged; efpecially at a time when the leaves are upon the tree, thefe being deftitute of them, have but a defpicable appearance; befides, thefe will attract noxious particles from the air, which are injurious to the trees; therefore the fooner they are cut out the better: in doing of this you fhould obferve to cut them clofe down to the place where they were produced, otherwife that part of the branch left will decay, and prove equally hurtful to the tree; for it feldom happens, when a branch begins to decay, that it does not die quite down to the place where it was produced, and, if permitted to remain long uncut, does often infect fome of the other parts of the tree. If the branches are large which you cut off, it will be very proper, after having fmoothed the cut part exactly even with a knife, chiffel, or hatchet, to put on a plafter of grafting clay, which will prevent the wet from foaking into the tree at the wounded part.

All fuch branches as run acrofs each other, fhould alfo be cut out; for thefe not only occafion a confufion in the head of the tree, but by lying over each other, rub off their bark by their motion, and very often occafion them to canker, to the great injury of the tree; and on old trees, efpecially apples, there are often young vigorous fhoots from the old branches near the trunk, which grow upright into the head of the trees: thefe therefore fhould carefully be cut out every year, left, by being permitted to grow, they fill the tree too full of wood; which fhould always be guarded againft, fince it is impoffible for fuch trees to produce fo much, or fo good fruit, as thofe trees whofe branches grow at a farther diftance; whereby the fun and air freely pafs between them, in every part of the tree. *Miller's Gard. Dict.*

PUCKBALL, a fpecies of mufhroom, full of duft.

PUDDOCK, or PURROCK, a fmall inclofure.

PULSE, a term applied to all leguminous plants, as tares, peafe, &c.

All the fpecies of pulfe afford great abundance of excellent manure, in the ftate in which nature prefents them. The cuftom of ploughing in green fucculent plants, is very ancient. All the Roman writers commend it highly, and with much reafon. Columella recommends particularly lupins, as a manure, which, if cut down and turned in while green, will have as good effect as the beft and ftrongeft dunging whatever. They may be fown upon poor land about the middle of September, and will enrich it greatly if ploughed in before they attain their full growth. In gravelly foils, they fhould be cut down after they have put forth their fecond flower; and in ftrong lands, after the third. In the former of thefe grounds they are turned in while young and tender, that they may quickly rot; and in the latter, they are let ftand till they grow ftronger, that they may bare up the more folid and ftiff clods of earth, and keep them the longer fufpended; by which means the air has freer accefs to the foil, and thefe clods, being heated and dried with the fummer funs, are the more eafily opened, and refolved into duft. Thus fays this judicious author, juftly remarkable for his fuperior fkill in hufbandry. But Mr. Miller is of a contrary opinion.

The *Maifon Ruftique*, a work of very high repute, as is evident from the great number of editions it has gone through, ftrongly and rightly recommends peafe, beans, lupins, vetches, and other fucculent plants, as excellent manures, efpecially for fandy ground. Thefe plants enrich the earth greatly if ploughed in, either green, or when in bloom. In ftrong land, they fhould not be turned down till the pods begin to harden.

In Piedmont and other places where they fatten their land with this manure, lupins are fown upon the fallow ground towards the end of June, immediately after the fecond ploughing, fo that they are ftill green when the third ploughing is given, and the corn is fown. Experience fhews the hufbandmen in thofe countries, that this method of ufing thefe plants for manure makes them ample amends for the lofs of the pulfe or fodder they might otherwife reap from them: but thofe who do not like to lofe any thing, plough in the hufks after they have taken out the grain.

Dr. Lifter likewife recommends for the improvement of fandy, light ground, or any clay well fanded, all plants of the pulfe or pea kind, and particularly, "upon experience, the wood vetch, which, befides its being perennial (at leaft with refpect to its roots) and its thriving even in woods and among bufhes in almoft every country, has thefe farther qualifications, that it fhoots out a thoufand roots far and wide, and fpreads itfelf under ground like quick-grafs; whilft it is fo rampant above ground, that it will climb a fathom and a half upon meafure, and preferve itfelf in fpite of weeds or drought. It may be fet, as well as fown, in furrows. For the former of thefe purpofes the roots may be dug up in September, which is alfo the time for gathering the ripe feed. The growth of the plants will be greatly advanced by fetting their roots; for the older they are, the ftronger, more numerous, and fuller of buds their fhoots will be. I fowed in the latter end of March the feeds which I had gathered in September, and had that year a very great increafe, the bed being thick covered over with grafs above two feet high: but it did not flower that year. I reckoned that one pea had put forth above thirty fhoots in Auguft of the firft year. In the fecond year, it flowered by the middle of June, and bore a wonderful crop, the roots being innumerable. I have obferved this pea very common in all the mountains, as well as plains of England, where bufhes or hedges are. Both the pea and grafs are very fweet, and very agreeable to cattle, as I have tried."

Buck-wheat and vetches are the two plants moft commonly fown in England, for manure. The beft time for ploughing them in, is when they are in bloom; being then in their moft fucculent ftate. Some farmers turn down their fecond crop of clover, to enrich the land for wheat in the autumn. This fhould be done early enough to give the plants fufficient time to putrefy thoroughly before the grain is fowed: otherwife it might prove prejudicial, by bringing on a heat which would hurt the corn.

The reverend and ingenious Mr. Eliot, of New England, prefers millet to every other plant for green-dreffing of land, on account of the cheapneſs of the ſeed, and the largeneſs of the ſtalks and leaves, which muſt afford a good coat to turn in when ploughed. An old farmer, who had long been in the practice of green-dreſſing, aſſured this gentleman, that he had increaſed the ſtrength of his land to a great degree, in a few years, by the following method. After his oats were harveſted, he added a little ſeed to the ſcattered grains, and then ploughed them in. Towards the end of September, he ploughed in the green oats, and ſowed rye; and the next ſummer, when the rye was well grown and full of ſap, he ploughed that in at the uſual ſowing ſeaſon, then ſowed wheat, and always had a large crop.

PURGING, the operation of evacuating the impurities of an animal body by ſtool.

Purging is often neceſſary in groſs full horſes, in ſome diſorders of the ſtomach, liver, &c. but ſhould be directed with caution. Before a purge is given to any horſe, it is neceſſary ſome preparation ſhould be made for it, in order to render the operation more ſafe and efficacious: thus a horſe that is full of fleſh ſhould firſt be bled, and at the ſame time have his diet lowered for a week, eſpecially thoſe that have been pampered for ſale; ſeveral maſhes of ſcalded bran ſhould alſo previouſly be given, in order to open the bowels, and unload them of any indurated excrement; which ſometimes proves an obſtacle to the working of the phyſic, by creating great ſickneſs and griping.

Let it be remembered, that a horſe is purged with difficulty; that the phyſic generally lies twenty-four hours in the guts before it works; and, that the tract of bowels it has to paſs through, is above thirty yards; and lying horizontally, conſequently reſinous and other improper drugs may, and often do, by their violent irritations, occaſion exceſſive gripings and cold ſweats, ſhave off the very mucus or lining of the guts, and bring on inflammations, which often terminate in mortifications, and death.

It is remarkable too, that the ſtomach and guts of a horſe are but thin, compared to ſome other animals of the ſame bulk, and therefore muſt be more liable to inflammation and irritation.

Horſes kept much in the ſtable, who have not the proper benefit of air and exerciſe, in proportion to their food, ſhould in ſpring have a mild purge or two, after a previous preparation by bleeding, lowering their diet, and ſcalded maſhes.

Horſes that fall off their ſtomach, whether it proceeds from too full feeding, or ingendering crudities and indigeſted matter, ſhould have a mild purge or two.

Horſes of a hot temperament, will not bear the common aloetic purges; their phyſic therefore ſhould be mild and cooling.

Purging is always found very beneficial in ſtubborn dry coughs; but mild mercurials joined with them, make them yet more efficacious.

Horſes that have thoſe ſorts of lameneſſes, that are ſaid to proceed from humours flying about (which are of the rheumatic kind, and in young horſes proceed from ſizy blood, and occaſion lameneſs in every limb) require frequent purging; and ſhould alſo have between whiles, medicines that attenuate and thin the fluids.

Horſes of a watry conſtitution, who are ſubject to ſwelled legs, that run a ſharp briny ichor, cannot have the cauſes removed any ways ſo effectually as by purging.

The firſt purge you give to a horſe ſhould be mild, in order to know his conſtitution.

It is a miſtaken notion, that if a proper prepared purge does not work to expectation, the horſe will be injured by it; for though it does not paſs by ſtool, its operation may be more efficacious, as an alterative to purify the blood, and it may paſs by urine, or other ſecretions.

Purging medicines are very ſucceſsfully given in ſmall quantities, mixed with others; and act then as alteratives.

If mercurial phyſick is given, care ſhould be taken that it be well prepared; and warmer cloathing, and greater circumſpection is then required.

Purges ſhould be given early in the morning upon an empty ſtomach; about three or four hours after the horſe has taken it, he ſhould have a feed of ſcalded bran; and a lock or two of hay may then be put in his rack. The ſame day give him two more maſhes; but ſhould he refuſe warm meat, he may be allowed raw bran.

All his water ſhould be milk warm, and have a handful of bran ſqueezed in it; but if he refuſes to drink white water, give it him without bran.

Early the next morning, give him another maſh; but if he refuſes to eat it, give him as much warm water as he will drink: let him be properly cloathed, and rode gently about. This ſhould be done two or three times a day, unleſs he purges violently, once or twice will then be ſufficient: at night give him a feed of oats mixed with bran.

During the working, a horſe ſhould drink plentifully; but, if he will not drink warm water, he muſt be indulged with cold, rather than not drink at all.

We ſhall here inſert ſome general forms of purges.

> Take ſuccotrine aloes ten drams, jallap and ſalt of tartar each two drams, grated ginger one dram, oil of cloves thirty drops; make them into a ball with ſyrup of buckthorn.

Or,

> Take aloes and cream of tartar each one ounce, jallap two drams, cloves powdered one dram, ſyrup of buckthorn a ſufficient quantity.

Or,

The following, which has an eſtabliſhed character among ſportſmen.

> Take aloes, from ten drams to an ounce and a half, myrrh and ginger powdered each half an ounce, ſaffron and oil of anniſeed each half a dram.

Mr. Gibſon recommends the following.

> Take ſuccotrine aloes ten drams, myrrh finely powdered half an ounce, ſaffron and freſh jallap in powder, of each a dram, make them into a ſtiff ball with ſyrup of roſes, then add a ſmall ſpoonful of rectified oil of amber.

The ſuccotrine aloes ſhould always be preferred to the Barbadoes, or plantation aloes, though the latter may be given to robuſt ſtrong horſes, but even then ſhould always be prepared with the ſalt, or cream of tartar; which by opening its parts, prevents its adheſion to the coats of the ſtomach, and bowels; from whence horrid gripings, and even death itſelf has often enſued. This caution is well worth remaking, as many a horſe hath fell a ſacrifice to the neglect of it.

Half an ounce of Caſtile ſoap, to a horſe of a groſs conſtitution, may be added to any of the above; and the proportions may be increaſed for ſtrong horſes.

When mercurial phyſick is intended, give two drams of calomel over night, mixed up with half an ounce of diapente and a little honey, and the purging ball the next morning.

The following, when it can be afforded, is a very gentle and effectual purge, particularly for fine delicate horſes; and if prepared with the Indian rhubarb, will not be expenſive.

> Take of the fineſt ſuccotrine aloes one ounce, rhubarb powdered half an ounce or ſix drams, ginger grated one dram; make into a ball, with ſyrup of roſes.

The following purging drink may be given with the utmoſt ſafety; it may be quickened, or made ſtronger, by adding an ounce more ſenna, or two drams of jallap.

Take fenna two ounces, infufe it in a pint of boiling water two hours, with three drams of falt of tartar; pour off, and diffolve in it four ounces of glauber falts, and two or three of cream of tartar.

This laft phyfick is cooling, eafy, and quick in its operation; and greatly preferable in all inflammatory cafes to any other purge, as it paffes into the blood, and operates alfo by urine.

When horfes lofe their appetites after purging, it is neceffary to give them a warm ftomach drink, made of an infufion of chamomile flowers, annifeeds and faffron: or the cordial ball may be given for that purpofe.

Should the purging continue too long, give an ounce of diafcordium in a pint of Port wine, and repeat it once in twelve hours, if the purging continues. Plenty of gum arabic water fhould alfo be given, and in cafe of violent gripes, fat broth glyfters, or tripe liquor, fhould be often thrown up, with an hundred drops of laudanum in each.

The arabic folution may be thus prepared.

Take of gum arabic and tragacanth of each four ounces, juniper berries and carraway feeds of each an ounce, cloves bruifed half an ounce; fimmer gently in a gallon of water, till the gums are diffolved: give a quart at a time in half a pail of water; but if he will not take it freely this way, give it often in a horn.

When a purge does not work, but makes the horfe fwell, and refufe his food and water, which is fometimes the effect of bad drugs, or catching cold, warm diureticks are the only remedy; of which the following are recommended

Take a pint of white wine, nitre one ounce, mix with it a dram of camphor diffolved in a little rectified fpirit of wine; then add two drams of oil of juniper, and the fame quantity of unrectified oil of amber, and four ounces of honey, or fyrup of marfhmallows.

Or,

Take Venice turpentine one ounce, incorporate with the yolk of an egg; nitre one ounce, then add juniper berries, and frefh annifeeds pounded, each half an ounce, unrectified oil of amber two drams; make into a ball with fyrup of marfhmallows.

PURSLANE, the name of an herb, commonly propagated in the kitchen-garden.

Purflane is raifed upon a hot bed by thofe who would have it among their early fallets; for it is too tender a plant to be fown in the open air before the month of April, and even then it muft be placed in a warm fituation: but it is of fo very cold a nature, that it cannot be fafely eaten in this country, except in the heat of fummer, during which a fupply may be eafily had by fowing it upon common beds of light rich earth, at three or four different times, about a fortnight or three weeks diftant from each other; fay, by fowing it upon thefe beds, becaufe its feeds, which are very fmall, fhould be fprinkled extremely thin over the ground, and then only patted down gently with the back of a fhovel, fo as juft to prevent their being blown away. The plants, which will rife in a few days, will require no other culture than keeping them free from weeds, and watering them two or three times a week in dry weather; for purflane delights in fomewhat more than ordinary moifture. In about fix weeks after fowing, they will be fit for ufe.

The green leaved, and the red or yellow leaved, commonly called golden purflane, are but varieties of the broad leaved, or garden purflane, which is the only fpecies cultivated in our kitchen gardens.

The feeds of purflane are faved from fome of the earlieft and fineft plants, which are left for this purpofe, whilft all the weak or fmall leaved ones about them are rooted out. When they are ripe, the ftalks which bear them fhould be cut down, fpread upon cloths, and dried in the fun during three or four days, houfing them each night. They fhould then be beaten out, fifted, cleaned, and laid up in a dry place. Some are of opinion, that the feeds of purflane are beft when they are about three years old; but that feems to be a miftake.

Q.

QUEEN-BEE, a name given by late writers to what ufed to be called the king-bee, or king of the bees; a large and long-bodied bee, of which kind there is only one found in every fwarm, and which is always treated with the greateft refpect by the reft. *See the article* BEE.

This is, indeed, the parent of the fwarm, and from the fœcundity of this one female, a whole hive is eafily and foon repeopled.

It is to be obferved, that the autumn and winter feafons deftroy a great number of the bees; fo that a hive, which was full in the fummer, is often found fo thinly peopled before the end of winter, that the bees feem only a few inhabitants in a very large city: by Midfummer again this fame hive fhall, however, be found fo well filled with inhabitants, that there fhall be a neceffity of fending out a colony in the name of a new fwarm, and yet the hive will remain as full as it can well hold. This increafe might well appear very amazing, if all the remaining bees of the hive were fuppofed to be females, and to join in it; but how much more fo when it muft be acknowledged, that it is all owing to one female, and that this queen-bee, or bee-mother, alone, has given origin to fuch an immenfe progeny?

The form of this bee, and there being only one fuch in a hive, naturally led all who faw it into an opinion of fomething fingular in its nature, and the antients determined that it muft be the king over the reft: they made it an abfolute monarch, and have fuppofed that all the bufinefs of the hive was done by its immediate orders; and that the feveral parties of bees allotted to work in the making the combs, in the filling their cells, in the ftopping the crevices of the hives, and in carrying away the filth, &c. had all their feveral ftations allotted them by this wife and provident monarch. This was giving great talents to the monarch-bee; but this was mere fancy, and it is plain, that, if this creature rules, it is over a people who all perfectly well know their feveral bufinefs: but it rather appears, that there is no fovereignty at all, but that this creature is refpected in a very high degree by the reft, as the common parent of the whole nation.

There were not wanting among the antients, however, fome who believed this large bee to be a female, and thefe pretend that fhe brought forth only females like herfelf, which fucceeded her in her reign. They had a very different opinion as to the origin of the common bees, not fuppofing them generated of animal parents like themfelves, but produced out of corruption, and born of the flefh of a bull or cow. Among the later writers this opinion, notwithftanding the fanction of the poet Virgil, has been laughed out of the world; yet it was long before the true origin of bees, even after this, was known. The author of the Female Monarchy, though well apprized of this great bee being of the female fex, yet fuppofed that fhe only produced young ones like herfelf; and pretended that the common bees copulated together for the production of other bees like themfelves: this, however, has been fince found to be wholly erroneous, the female, or queen-bee, giving birth to all, and thefe common bees being of no fex at all. Many of the authors who have not given into the idle opinion of the bees being bred of putrid flefh, have yet given them an origin not lefs idle and ridiculous. They pretend that the bees are exempted from the pain of producing either eggs or young; and that their offspring are formed of the juices of flowers, the different kinds, as the drones, females, &c. owing their rife to juices of different kinds. Thefe, and a number of other falfe notions, have been propagated in regard to bees; but their true origin could not well be found till we were in a condition to fee what paffes at certain times within the receffes of the hive, which is done by the ufe of that excellent invention, the glafs hive. By this, and by the help of diffections, we may eafily inform ourfelves perfectly of the true ftate of the cafe. The parts of generation are the fubjects of our enquiry for this purpofe, and, though the bodies of thefe animals are fo fmall, thefe are ufually fufficiently large to be diftinguifhed, often taking up more room in the abdomen than all the other parts together. Thus, if the large long-bodied bee be opened, the abdomen will be found to contain vaft numbers of oblong bodies, which any one acquainted with infects will eafily diftinguifh to be eggs: vaft numbers of thefe are large enough to be obfervable by the naked eye, but, when the affiftance of glaffes is called in, there are difcerned a vaft number of other fmaller eggs, which exceed all computation. It is eafy to determine from this, that this creature, fo long efteemed a male, is in reality, a female, and is in condition to give birth to a very numerous pofterity.

In order to diftinguifh this, however, a proper time muft be chofen for the diffection, and the moft proper of all is when the creature is juft ready to depofit her eggs. This is in the months of April and May, and the moft certain time of all is when fhe is in a hive where a new fwarm have been received about ten days before: if fhe be diffected at other times, the eggs are lefs vifible; and, particularly in winter, there requires a good glafs to fhew the rudiments of them. This is a difagreeable experiment, indeed, becaufe it is always the deftruction of a future fwarm; all the eggs we fee in the diffected female being what would have produced bees to labour for our benefit.

When the body of one of the drones is opened, there is found, inftead of thefe vaft numbers of eggs, a part feeming proper for a male organ of generation: and in the abdomen a number of veffels running in feveral windings and contortions, and filled with a milky humour. Thefe feem deftined for the important ufe of impregnating the

the eggs in the belly of the female, and it is very natural to determine from this that thefe are the males.

The common bees, when diffected, at whatever time of the year never fhew the leaft marks of any fex at all. The inteftines of thefe bees are found at times to be more or lefs diftended with honey, and with rough wax; but there are never difcovered any eggs, nor any of the winding feminal veffels, fo that it is plain they have no fhare in propagating the fpecies: and the obfervation of the fwarms from time to time, with the affiftance of glafs hives, gives proof to what the diffections feem to make fufficiently certain without this evidence.

The female bee refides within the center of the hive, always living in one of the fpaces between the combs; if fhe occafionally comes out to the furface, and is feen walking over the edge of a comb, fhe is to be well obferved at thofe times; for her only bufinefs is the laying her eggs in fome of the empty cells of that part of the comb, which done, fhe always retires again.

In order to fee the female, or mother bee, employed in this operation, we are to obferve in the morning hours, between feven and ten, what paffes in a glafs-hive into which a fwarm have been received a few days before. The fpeed with which the common bees labour in making their combs on this occafion is almoft incredible, and they feem not only to labour to have cells to depofit their honey in, but to know that the parent bee is at this time loaded with eggs for the production of a numerous progeny, and that fhe has an immediate neceffity of cells for the depofiting them in. This neceffity is fo urgent, that fhe is often forced to depofit them in cells not yet finifhed; though the bees labour fo vigoroufly, that they often will erect a whole large comb in one day. If the hive be narrowly watched at thefe times in the morning hours, the female bee will be foon found employed in her work, and will be feen dropping her tail by turns into feveral cells every day. If the combs be examined a day or two after this, they will alfo be found to contain the eggs; one of thefe is placed in each cell, and appears in form of an oblong white body, fixed either to the folid angle of the bafe, or to one of the angles compofed by the rhombs which form the triangular bafe of the cell, and is always attached in fuch a manner, that it lies nearly in an horizontal pofition.

The flat glafs hives are the moft favourable for the making thefe obfervations, fince in thofe the combs are fo narrow and fo numerous, that the whole is taken in view at a time, from one fide or the other; and there are always feveral combs to be made choice of for the operation; in the morning hours of April and May, the female mother-bee will be ufually feen walking very foberly over one or other of thefe combs, attended by a guard of about twenty of the common bees, all placing themfelves in fuch a manner, that their faces are turned towards her, and all paying her the greateft marks of homage and adoration. As fhe walks along in this ftate, fhe examines every cell as fhe paffes over, and fuch as fhe finds yet empty, and fit for her purpofe, fhe refts at: and, introducing the hinder part of her body at the top, plunges it fo deep in that her tail touches the bottom. Then fhe depofits one egg and no more, and this is at that time covered with a glutinous matter, which faftens it to the place where it is laid: from this cell the female paffes to feveral others, where fhe depofits her eggs in the fame manner.

Some authors who have written of the polity of bees, have reprefented the time of the female bee's laying her eggs as a feafon of feftivity and rejoicing in the hive; but this does not at all appear to be the cafe; the few bees which attend her on this occafion feem the only ones that know any thing of the matter, and their behaviour favours more of homage and refpect than of joy: they are continually ftroking and brufhing her clean with their legs and with their trunks, and offer her from their own mouths the fineft honey, when fhe has occafion for food. The reft are all employed in their proper offices, and the work of the hive goes on as ufual; and, indeed, it is well that it does fo, for this time of rejoicing would be of very bad confequence to the affairs of the hive, if carried on as fuppofed, fince the female bee is thus employed, more or lefs, during the whole fummer months.

When the female bee has laid fix or feven eggs, fhe always takes a time of refpite or repofe; and, during this time, the bees which form her levee are doubly bufy in their careffes, fome brufhing her head and breaft with their trunk, but feveral being always employed together to cleanfe the hinder rings of the body, which have been fouled by being thruft into the cells. When this is done, fhe begins again; but Mr. Reaumur obferves, that he never could fee a female lay more than ten or twelve eggs at one time: he fuppofes that his prefence difturbed the creature, and finally drove her into the inner parts of the hive, where fhe might continue her works in cells lefs expofed. It is not difficult to compute the number of eggs which the female lays every day, from the fwarm which is ready to leave the hive at the end of May: this fwarm ufually amounts to at leaft twelve thoufand, and as the hive out of which thefe depart is not lefs peopled by the their lofs, it is evident that they were all the produce of the eggs depofited by the female in the preceding months of April, with a part of March, and a few of the firft days of May. On a moderate computation, on thefe principles it will appear, that the female bee cannot lay lefs than two hundred eggs every day, for a long fpace of time together; and this, though feemingly a monftrous increafe, is yet much lefs than that of fome other of the winged infects, in one of which, a two-winged fly, that author counted no lefs than twenty thoufand living worms, all ready to be depofited by the parent, and to become flies of the fame kind.

It has been ftrongly objected againft this fyftem, that, though the female bee lays eggs, fhe is not the only one that lays; and many will not give up the opinion of the common bees alfo laying fome eggs, though but a few in number; obferving, that, if each of thefe lay only four or five eggs, it would be enough to give birth to a whole fwarm, without fuppofing that this prodigious fœcundity belonged to the female bee alone: but this is running into the old error of the female producing only females like herfelf; whereas, if we obferve the cells in which we fee the female depofit her eggs, we fhall in the fequel find the common bees produced from thefe eggs, and iffuing out of thefe cells: this is a fufficient proof to any fair reafoner, fince it appears very plain, that, if the female produces them, they do not produce one another. It is alfo evident, that not only thefe common or working bees, but alfo the drones, or male bees, are produced from the eggs of this fame female; and there is this remarkable forecaft in the female, that fhe always depofits the eggs which are to give origin to thefe, in peculiar cells, proper for the reception of the worms which are to be hatched from them. It is obferved, in examining a hive, that there are always fome combs, or fome parts at leaft of combs, the cells of which are much larger than thofe of the other parts or combs: thefe large cells are deftined for the refidence of the larger worms, which are to produce the drones or male bees. It has been obferved as a miraculous fingularity by fome, that the female bee always knows before-hand, whether the egg fhe is going to lay will produce a male or a common bee; and that, according to this knowledge, fhe never depofits the eggs for a male in a fmaller cell, nor that of a common bee in a large one; but there is, in reality, lefs wonder in this than is fuppofed, for the eggs of which the drones are to be hatched are much larger while in the body of the female than thofe of which the common bees are to be produced, and the whole occafion of this choice in regard to the placing of them is, that, when the creature finds a large egg coming forth, fhe feeks one of the large cells to depofit it in; and when the common fmall eggs are coming, fhe contents herfelf with the common cells.

It is very natural to believe, that the female bee lays a third kind of eggs; and that, befides producing many thoufand common, or working bees, and many hundreds of the males or drones, fhe ought to lay one egg at leaft capable of producing a female like herfelf, which is to be the mother of a future progeny, and the queen of the prefent race; fince, without fuch a one for their leader, the young brood would never leave the hive in the nature of a colony, and fettle themfelves elfewhere. What we thus perceive ought to be the cafe, is alfo found in reality to be be ſo, and the female, beſides the other kinds of eggs, is found by a ſtrict obſervation to lay alſo eggs of this kind. We might perhaps only expect one female bee to be produced for each ſwarm, but, as nature has ſeemed every where prodigal in the manner of the increaſe of her works, ſo it is in this caſe alſo. What millions of ſeeds are produced on a common elm-tree, for one that ſtrikes and ſucceeds ſo well as to grow up to be a tree? And, of the number of young produced from the ſpawn of a carp, how few live to the ſize of a parent? Thus it alſo is in regard to the female bees: nature, though it has allotted only one of this kind, as abſolutely neceſſary to the new ſwarm, yet has given abundance of chances for that one to ſucceed, by the female's uſually laying at leaſt ten eggs for the production of the female offſpring, and often not leſs than twenty: there are, indeed, ſome ſeaſons when not one female is produced; but in theſe ſeaſons there is no ſwarm going out from the old hive, the creatures being informed by nature, that they have no buſineſs for combs and cells when they can have no offſpring to rear in them.

The working bees are not only very obedient to, and very careful of their queen, or female parent; but they are alſo very ſollicitous about her progeny. This is very evident in the ſtructure of the cells, which they prepare for the reception of thoſe eggs which are to be hatched into females. It has been before obſerved, that they prepare larger cells for the eggs which are to become drones, or male bees, than for thoſe which are to produce workers like themſelves. The large cells deſtined for the drones are, however, of the ſame ſhape and figure with the others, differing only in ſize; but this is not the caſe with thoſe deſtined for the female offſpring: theſe are not only very large, but very clumſily contrived, for the ſake of ſtrength; their ſides being much thicker than thoſe of the reſt, and their figure oval. The bees are extremely ſparing of their wax on all other occaſions, but for the conſtruction of theſe royal cells, as they may not improperly be called, they are as remarkably profuſe: one of the royal cells will weigh more than an hundred and fifty of the common kind. The bees are no more ſparing of the room than of the materials in the conſtruction of theſe royal habitations: they are often placed near the center of a comb, and a vaſt number of other cells are deſtroyed for their baſe; often alſo they hang down from the reſt of the comb, in form of ſtalactitæ from the roofs of ſubterraneous caverns.

A cell of this kind, when firſt formed, repreſents an acorn cup; but it is ſoon lengthened beyond the poſſibility of retaining that figure, and it remains thus till the creature is hatched from the chryſalis or nympth ſtate, and comes out of it; after which the bees, to loſe no room in the hive, form other common cells upon it, and the only remaining mark of the female cell, is the appearance of a knot in the place where it once ſtood.

The number of cells deſtined to receive the eggs which are to produce female bees are ſo few, and they are commonly placed in ſuch cloſe parts of the hive, that there is no great probability of ſeeing the female employed in laying her eggs in them: there is no reaſon to doubt the fact, however, ſince, when we know that ſhe lays eggs for the production of the male and the working bees, there is no wonder that ſhe ſhould alſo lay ſome for the production of females like herſelf.

It might ſeem much harder to conceive how ſo vaſt a number of bees ſhould be produced from this one, as we know are produced from her; but, when one of the females is opened, the vaſt number of eggs diſcovered in each of her ovaries makes the prodigious increaſe no way wonderful.

Swammerdam obſerved, that the number of veſicles in the ovary of the female bee was aſtoniſhingly great; he eaſily counted an hundred and fifty in each ovary, and could count about ſeventeen eggs in each veſicle large enough to be diſtinctly viſible; each ovary contains, therefore, two thouſand five hundred and fifty eggs, and both ovaries five thouſand one hundred. When we find ſo many eggs at once diſtinguiſhable by their ſize, it will be eaſy to conceive, according to the common courſe of nature in the propagation of inſects, that there may be more than as many too ſmall to be yet diſtinguiſhable; and, at that rate, the number of twelve thouſand bees, which is the quantity that compoſes a moderate ſwarm, is not wonderful for the product of the eggs of one female for one ſeaſon. *Reaumur's Hiſt. Inſ.*

QUICK, or *Quickſet-hedge*, a general name for all hedges, of whatever ſorts of plants they are compoſed, to diſtinguiſh them from dead hedges; but, in a more confined ſenſe of the word, it is applied to the white or hawthorn, the ſets or young plants of which are raiſed by the nurſery gardeners for ſale. *See the article* FENCE.

QUICKSILVER, a very ponderous fluid mineral, generally called mercury.

In the year 1765, a diſcovery was made (or rather revived, for it is mentioned by Mr. Bradley) that quickſilver was a ſovereign remedy for deſtroying inſects on trees.

The narrative of this diſcovery was contained in a letter written by Dr. R———, to Dr. P———, in which the former begs the aſſiſtance of the latter "in laying before the learned world an account of ſome experiments, that have been tried with ſucceſs, and which, when fully known, will, he believes, be of very great ſervice to the vegetable part of the creation, by totally deſtroying thoſe pernicious inſects, that are apt to infect the tender leaves and young ſhoots of our choice fruit-trees: and for which, no remedy, that he had ever heard, or read of, has been as yet propoſed, that is either adequate to the diſeaſe, or effectual to the cure." Dr. R———, therefore, in the following part of the letter, deſires Dr. P——— "to lay before the Society for the Encouragement of Arts, &c. the following experiment, that was tried laſt ſpring, with ſucceſs, by one George Bradford, a clothier in the city of Hereford, and a very ingenious young man: in order, after the experiment has been fully tried, they may reward him in proportion as he may ſeem intitled to it." But Dr. R——— adds, that "whether he may be thought worthy of any recompence, or not, he very chearfully ſubmits it to the trial of the curious; and hopes, they may reap the ſame advantages, he did laſt year, by clearing their trees of theſe pernicious inſects." The doctor then proceeds as follows, to give the relation of Mr. Bradford's invention and ſucceſs. "The firſt tree he tried the experiment upon, was a favourite plum-tree: I think a green gage. He was afraid of trying it on the whole body of the tree at firſt: as he did not know, but that it might kill it at once: and therefore he ſelected out a particular branch, that was deſigned to be cut quite away, at the winter pruning, for the ſubject of his firſt eſſay. The method of the experiment is this: he took a ſmall awl, and pierced, ſloping, through the rind, and into part of the wood of the branch, but not to the heart or pith of it; and poured in a ſmall drop or two of quickſilver; and ſtopt it up with a ſmall wooden plug made to fit the orifice: and the reſult of this experiment was, that the inſects all dropt off, from that very branch, the next day; and, in a day or two more, from off the other branches of the tree, without any other puncture: and the tree continued in full vigour; and throve well all the ſummer after. Encouraged by this ſucceſs of the firſt eſſay, he next tried it upon a honey-ſuckle; the leaves of which were quite covered with them: and here he ſcraped away the top of the ground with a trowel; and run his awl, in the ſame ſloping manner, into the main ſtem juſt above the roots; but, with the ſame caution as above, not quite to the inner pith; and the ſucceſs was the ſame as before. The inſects all dropt off dead the next day after the experiment was made. The above facts you may ſafely depend upon: and I ſaw both the trees, on which the experiments were made, ſince Chriſtmas laſt; and they then ſeemed to be both very healthy and well. I did not, indeed, ſee the operation performed, as I was at that time on my reſidence at L———; but the method, manner, and ſucceſs, as above related, I had from Mr. Bradford's own mouth."

This letter from Dr. R———, was dated March 11, 1765, though the delivery of it to the ſociety was deferred from accident till February laſt. But Dr. P———, in his letter to the preſident, deſiring him to lay the other before the ſociety, remarks, that experiments have been ſince made, which confirms the firſt obſervations. He ſays, "the advantage, however, hath ariſen from this delay, that Dr. R——— hath had fuller proof of the ſucceſs of this diſcovery."

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We ſhall only add, that this method has ſince been tried by ſeveral members of the ſociety, and found fully to anſwer the intended purpoſe.

QUINCUNX, a diſpoſition of trees originally formed into a ſquare, conſiſting of five trees, one at each corner, and a fifth in the middle; which diſpoſition often repeated forms a regular grove, and then viewed by an angle of the ſquare or parallelogram, repreſents equal and parallel alleys.

QUINCE-TREE, a fruit-tree well known, and of which there are ſeveral kinds, as the pear-quince, the apple-quince, and the Portugal quince, &c.

Quince-trees are eaſily propagated, either by ſuckers, or cuttings, planted in a moiſt ſoil. Suckers are the worſt to raiſe them from; and cuttings are generally preferred to layers, becauſe they are of more ſpeedy growth. Theſe cuttings ſhould be ſet early in the autumn, and ſhould be watered often, to encourage their rooting. In the ſecond year after planting, they will be fit to remove into the nurſery, where, after being ſet a foot aſunder in rows three feet diſtant from each other, they ſhould be managed as before directed for apples. After two or three years growth in the nurſery, they will be large enough to tranſplant into the places where they are to remain. A moiſt ſituation, ſuch, for example, as the ſide of a river, pond, or ditch, will make them produce the moſt, and the largeſt, fruit: but that which grows on a dry ſoil will be better taſted, and earlier ripe. Theſe trees require no other pruning, than keeping their ſtems clear from ſuckers, cutting away all croſs branches, and diſplacing all upright luxuriant ſhoots from the middle of the tree, that its head may not be too much crowded with wood: for that is of bad conſequence to all fruit-trees. A ſure way to have the beſt ſorts, is to graft or bud them upon ſtocks of their own kind raiſed from cuttings. The trees ſo managed will bear fruit much ſooner, and more plentifully, than thoſe which are raiſed from ſuckers or layers. The Portugal quince is the moſt valuable.

QUIT-RENT, a ſmall rent payable by the tenants of moſt manors, whereby the tenant is quit, or free, from all other ſervices; and is ſaid to be an acknowledgement of their ſubjection to the lord of the manor.

QUITTOR, an ulcer formed between the hair and hoof, uſually on the inſide quarter of a horſe's foot; it often ariſes from treads and bruiſes, ſometimes from gravel, which by working its way upwards, lodges about the coronet: if it is only ſuperficial, it may be cured with cleanſing dreſſings, bathing the coronet every day with ſpirit of wine, and dreſſing the ſore with precipitate medicine.

But if the matter forms itſelf a lodgment under the hoof, there is no way then to come at the ulcer, but by taking off part of the hoof; and if this be done artfully and well, the cure may be effected without danger.

When the matter happens to be lodged near the quarter, the farrier is ſometimes obliged to take off the quarter of the hoof, and the cure is then for the moſt part but palliative; for when the quarter grows up it leaves a pretty large ſeam, which weakens the foot: this is what is called a falſe-quarter, and a horſe with this defect, ſeldom gets quite ſound.

If the matter, by its confinement, has rotted the coffin-bone, which is of ſo ſoft and ſpongy a nature, that it ſoon becomes ſo, you muſt enlarge the opening, cut away the rotten fleſh, and apply the actual cautery, or hot iron pointed pyramidically, and dreſs the bone with doſſils of lint, dipped in tincture of myrrh, and the wound, with the green, or precipitate ointment. When the ſore is not enlarged by the knife, which is the beſt, and leaſt painful method, pieces of ſublimate are generally applied, which bring out with them cores, or lumps of fleſh: blue vitriol powdered, and mixed with a few drops of the oil, is uſed alſo for this purpoſe, and is ſaid to act as effectually, and with leſs pain and danger. *Bartlet's Farriery, page* 303.

R.

RABBIT, a well known animal of the hare kind, with a very ſhort tail.

The female or doe rabbit goes with young thirty days, and then ſhe kindles; and if ſhe take not buck preſently ſhe loſes her month, or at leaſt a fortnight, and often kills her young and eats them.

In England they begin to breed at a year old, but in ſome places much ſooner; and they continue breeding very faſt from the time when they begin, four, five, ſix, or ſeven times a year being common with them. They have uſually from four to ſeven in a litter, and hence its is that a ſmall number at firſt will ſoon ſtock a whole warren, if left to breed a little while undiſturbed. The does cannot ſuckle their young till they have been at buck again: this therefore is to be done preſently, elſe there is a fortnight loſt of the time for the next brood, and the preſent brood alſo probably loſt. When the buck goes to the doe, he always beats and ſtamps very hard with his feet, and, when he has copulated with her, he falls backwards, and lies as it were in a trance; in this ſtate it is eaſy to take him, but he ſoon recovers from it.

The buck rabbits, like our boar-cats, will kill the young ones, if they can get at them; and the does in the warrens prevent this, by covering their ſtocks, or neſts, with gravel or earth, which they cloſe ſo artificially up with the hinder part of their bodies, that it is hard to find them out. They never ſuckle the young ones at any other time than early in the morning, and late at night, and always, for eight or ten days, cloſe up the hole at the mouth of the neſt, in this careful manner, when they go out. After this, they begin to leave a ſmall opening, which they increaſe by degrees, till at length, when they are about three weeks old, the mouth of the hole is left wholly open, that they may go out: for they are at that time grown big enough to take care of themſelves, and to feed on graſs.

People who keep rabbits tame for profit, breed them in hutches, but theſe muſt be kept very neat and clean, otherwiſe they will be always ſubject to diſeaſes. Care muſt be taken alſo to keep the buck and does apart till the latter have juſt kindled, then they are to be turned to the bucks again, and to remain with them till they ſhun and run from them.

The general direction for the chooſing of tame rabbits is, to pick the largeſt and faireſt; but the breeder ſhould remember, that the ſkins of the ſilver-haired ones ſell better than any other. The food of the tame rabbits may be colewort and cabbage leaves, carrots, parſnips, apple-rinds, green corn, and vetches, in the time of the year; alſo vine leaves, graſs, fruit, oats, and oatmeal, milk-thiſtles, ſow-thiſtles, and the like; but with theſe moiſt foods they muſt always have a proportionable quantity of the dry foods, as hay, bread, oats, bran, and the like, otherwiſe they will grow pot-bellied, and die. Bran and grains mixed together have been alſo found to be very good food. In winter they will eat hay, oats, and chaff, and theſe may be given them three times a day; but when they eat green things, it muſt be obſerved that they are not to drink at all, for it throws them into a dropſy. At all other times a very little drink ſerves their turn, but that muſt always be freſh. When any green herbs or graſs are cut for their food, care muſt be taken that there is no hemlock among it, for, though they will eat this greedily among other things, when offered to them, yet it is ſudden poiſon to them.

Rabbits are ſubject to two principal infirmities. Firſt, the rot, which is cauſed by the giving them too large a quantity of greens, or from the giving them freſh gathered, with the dew or rain hanging in drops upon them. It is over moiſture that always cauſes this diſeaſe; the greens therefore are always to be given dry, and a ſufficient quantity of hay, or other dry food, intermixed with them, to take up the abundant moiſture of their juices. On this account the very beſt food that can be given them, is the ſhorteſt and ſweeteſt hay that can be got, of which one load will ſerve two hundred couples a year; and out of this ſtock of two hundred, two hundred more may be eat in the family, two hundred ſold to the markets, and a ſufficient number kept in caſe of accidents.

The other general diſeaſe of theſe creatures is a ſort of madneſs: this may be known by their wallowing and tumbling about with their heels upwards, and hopping in an odd manner into their boxes. This diſtemper is ſuppoſed to be owing to the rankneſs of their feeding; and the general cure is the keeping them low, and giving them the prickly herb, called tare thiſtle, to eat.

The general computation of males and females is, that one buck rabbit will ſerve for nine does; ſome allow ten to one buck, but thoſe who go beyond this always ſuffer for it in their breed.

The wild rabbits are to be taken either by ſmall cur dogs, or by ſpaniels bred up to the ſport; and the place of hunting thoſe who ſtraggle from their burrows is under cloſe hedges, or buſhes, or among corn-fields and freſh paſtures. The owners uſe to courſe them with ſmall greyhounds, and, though they are ſeldom killed this way, yet they are driven back to their burrows, and are prevented from being a prey to others. The common method is by nets, called purſe-nets, and ferrets. The ferret is ſent into a hole to force them out, and the purſe-net, being ſpread over the hole, takes them, as they come out. The ferret's mouth muſt be muffled, and then the rabbit gets no harm. For the more certain taking of them, it may not be improper to pitch up a hay net or two, at a ſmall diſtance from the burrows that are intended to be hunted: thus very few of the number that are attempted will eſcape.

Some

Some who have not ferrets fmoak the rabbits out of their holes with burning brimftone and orpiment. This certainly brings them out into the nets; but then it is a very troublefome and offenfive method, and is very detrimental to the place, as no rabbit will, of a long time, afterwards come near the burrows which have been fumed with thefe ftinking ingredients.

RACK, a wooden frame made to hold hay or fodder for cattle.

RADIATED *Flowers*, fuch as have feveral femi-flofcules round a difk, in form of a radiant ftar: thofe which have no fuch rays, are called difcous flowers.

RADICLE, that part of the feeds of plants, which upon vegitating becomes its root, and is difcoverable by the microfcope.

RADISH, the name of a well known vegetable, and which is commonly cultivated in the kitchen-garden for its root.

Radifhes are fown in different feafons, according to the time when they are defired for ufe. Thofe fown in September will be fit to eat at Chriftmas, if they are not deftroyed by froft: but they muft be ufed whilft very young, for they foon grow hot and fticky. If fown towards the end of October, which is commonly the time of fowing for the earlieft crops, they will be fit for the table in the beginning of March. Thofe fown at Chriftmas, if the feafon is mild, and the ground in good order, will, if they efcape the froft, be fit for eating about the end of March or beginning of April; and by continuing the fowing once a fortnight, from the middle of January till the beginning of April, always obferving to fow the earlieft crop in the warmeft and beft fheltered fituations, and the later ones in a moift foil and open fituation, without which they will run up, and grow fticky, before they are fit for ufe, a regular fucceffion of thefe roots may be had throughout the feafon. The tendereft, and mildeft to the tafte, are thofe which have been raifed in deep, rich, and light mould.

When the radifhes are come up, and have got five or fix leaves, they muft be thinned wherever they ftand too clofe; for otherwife they will run up in tops, and not increafe in their roots. Some thin them by hand: but it is much better to ufe a fmall hoe, which will ftir the ground, deftroy the weeds, and promote the growth of the young plants. They may be left about three inches afunder, if they are intended for drawing up fmall; but fix inches will be little enough, if they are to ftand till they are pretty large.

The kitchen gardeners about London, who pay great prices for their ground, and therefore are obliged to make it produce as many crops as poffible in the year, fow carrot feed with their early radifhes, in order that if the radifhes are killed foon after their coming up, as they fometimes are, the carrots may remain, for the feeds of thefe laft generally lie in the ground five or fix weeks before they grow, while thofe of the radifhes fprout in about a fortnight: but when both crops fucceed, the radifhes muft be pulled up while very young; or they will weaken the carrots, fo that thefe laft will not be able to fupport themfelves after the former are gone.

It is alfo the conftant practice of thefe induftrious and intelligent men, to fow fpinage with their latter crop of radifhes: for after the radifhes are taken off, and the ground has been cleared between the plants of fpinage, thefe laft will grow up fo prodigioufly as to cover the whole fpace in a fortnight's time: and if this fpinage is of the broad leaved kind, it will be larger and fairer than it ufually is when fown alone; becaufe moft people are apt to fow it too thick, when they do not mix it with any other crop.

The fmall topped, the deep red, the fcarlet, and the long topped ftriped radifh, are the varieties generally cultivated in kitchen gardens. The fmall topped is moft commonly preferred, becaufe it takes up the leaft room: but a fmall fpot of ground will furnifh, from each fowing, as many radifhes of any kind as can be fpent in a family while they are good.

The Naples radifh, which has a very white, round, fmall, and fweet root, may be propagated in the fame manner as the common fort, excepting that it fhould not be fown till the beginning of March, and the plants fhould be allowed a greater diftance. It is not very common in this country; and, indeed, its feeds are apt to degenerate here.

The white and the black Spanifh radifhes will be fit for the table by the end of Auguft, or the beginning of September, if they are fown about the middle of July, or a little earlier, and will continue good till the froft fpoils them. Thefe fhould be thinned to a much greater diftance than any other fort: for their roots will grow as big as common turneps. If they are drawn out of the ground before a hard froft comes on, and laid up in dry fand, in the fame manner as is practifed for carrots, they will keep good all the winter.

To fave the feeds of radifhes, fome of the ftraiteft and beft coloured roots fhould be planted in rows three feet afunder, and at the diftance of two feet from each other in the rows, in deep and well dug ground. If the feafon is dry, they muft be watered from time to time till they have taken root, after which they require no farther care but keeping them clear from weeds; nor need thefe be feared after the branching feed-ftalks of the radifhes have over-fpread the ground, as they will foon do, in fuch manner as to prevent their farther growth.

In this tranfplanting of the radifhes, an allowance fhould always be made for bad feafons; becaufe the very fame plants will not yield a fourth part of the quantity of feeds in dry feafons, that they would do in a moift feafon.

When the feed begins to ripen, it fhould be carefully guarded from birds; and when it is ripe (which is known by the pods turning brown), it fhould be cut, dried in the fun, threfhed out, and laid up in a place where mice cannot come at it.

Horfe-RADISH, a well known plant, cultivated in kitchen-gardens.

Horfe-radifh is propagated by cuttings or buds from the fides of the old roots. The beft feafon for this work is in October or February; the former for dry lands, and the latter for moift. The manner of doing it is as follows: provide yourfelf with a good quantity of off-fets, which fhould have a bud upon their crowns; but it matters not how fhort they are: therefore, the upper part of the roots which are taken up for ufe, fhould be cut off about two inches long with the bud to it, which is efteemed the beft for planting. Then make a trench ten inches deep, in which you fhould place the off-fets at about four or five inches diftance each way, with the bud upward, covering them up with the mould that was taken out of the trench: then proceed to a fecond trench in like manner, and continue the fame until the whole fpot of ground is planted. After this, level the furface of the ground even, obferving to keep it clear from weeds, until the plants are fo far advanced, as to be ftrong enough to over-bear and keep them down. With this management, the roots of the horfe-radifh will be long and ftraight, and free from fmall lateral roots; and the fecond year after planting will be fit for ufe. It is true, they may be taken up the firft year, but then the roots will be but flender; therefore it is the better way to let them remain until the fecond year. The ground in which this is planted ought to be very rich, otherwife the roots will make but a fmall progrefs.

Woollen RAGS, and the nippings of the pitch-marks upon fheep, are a fingularly good manure. The rags fhould be chopped fmall, about an inch or two fquare, and fcattered on the earth at the fecond ploughing; for being thereby covered, they will begin to rot by feed-time. They imbibe the moifture of dews and rain, retain it long, and, as Dr. Home obferves, thereby keep loofe foils in a moift ftate. They coft about four-pence a bufhel at London, from whence many loads are fent every year to Dunftable, which is thirty-three miles, where they are laid even on ftiff-lands, juft after the fowing of the corn, allowing to the acre four facks of fix bufhels each.

RAG-WORT, or as it is called in Yorkfhire, *feagrim*, is a very pernicious weed.

The reverend Mr. Camber, of Eaft-Newton, has obliged the public with the following obfervations on the growth and deftruction of ragwort, or feagrim.

“ This plant, ſays he, has a ſtalk, in its early ſtate, green, but, as it advances in age, inclining to violet or purple, eſpecially downwards. Its flowers are yellow, and thick-ſet, and compoſed each of a number of ſmall-pointed leaves. It runs to ſeed in the latter end of ſummer. The ſmell, both of the ſtalk and leaves, which are jagged, (whence probably it obtains one name) and the flower itſelf, are offenſive to all animals, I think ; for I have obſerved that hardly any creatures feed upon it, except almoſt hungered or ſtarved. I have not indeed obſerved whether or no aſſes reject it.

“ Like moſt other weeds, it thrives beſt in the beſt ſoils, either natural or artificial ; and I took up a plant of it in my orchard, about two years ago, (with the root) which, when in flower, touched my chin, (my height is about five feet eight or nine inches) and its root, which is round, and thick ſet with taws, was much larger than a new-born child's head : but the uſual dimenſions are much leſs than theſe.

“ About four years ago, I obſerved the ſpreading of this weed in that part of this eſtate which was in our own hands. I took notice, that neither cows nor horſes eat it ; and when I ſmelled it, I ceaſed to wonder that they did not. It was obvious to remark, that a weed ſo bulky as this, and ſo groſs, muſt extract much nouriſhment from the earth, and that it was adviſable to get rid of it as faſt as poſſible. The moſt eaſy method was mowing. I therefore ordered a ſervant to mow theſe weeds in the paſtures as near to the ground as he could ; and I hoped that the common mowing in the meadows would be ſufficient to deſtroy them : but I ſoon found my miſtake ; for in a very few weeks theſe offenſive ſtrangers ſhot up again into a ſtalk and leaf, and even flower, though all in much ſmaller ſize than before, but with this diſagreeable circumſtance, that the root was ſo far from being injured with the ſcythe, that for one ſtalk ſeveral aroſe, and the root ſeemed to have gained new vigour from the wound.

“ I now applied myſelf to plucking up by the roots of theſe odious inmates, and found new difficulties ; for while the ground was dry, as it uſually is in the latter end of ſummer, I found the ſtalks of ſuch of the ſeagrims as were longeſt, and afforded the tighteſt graſp, either break in plucking, and leave the root in the ground entirely, or at beſt bring with it only a ſmall part of the root ; and when the wet weather came on, and looſened the ground, and made it poſſible, or even eaſy, to bring away the whole ball of the root, yet the ſeaſon of ſeeding was come on alſo, and the earlieſt ripe ſeeds had diſperſed themſelves, and produced an aſſurance of a larger crop for ſucceeding years than the moſt careful plucking of the preſent crop could deſtroy.

“ But if theſe were the difficulties which attended my attempts to eradicate thoſe ſeagrims, which had happened not to be mowed, I was much more embarraſſed by thoſe which had been ; for here it was impoſſible to get any ſuch faſt hold, as to pluck them up with much, or even any root.

“ I now applied myſelf to enquire what gentlemen or farmers were plagued with this weed, and what methods they had tried with ſucceſs to deſtroy it.

“ I was told by a gentleman in my own neighbourhood, that Sir G. Cayley, of Brompton, near Scarborough, baronet, had been plagued with this weed, and had purſued the method of plucking with ſucceſs.

“ Animated by this aſſurance, I reſolved to purſue this method with great attention ; and as it ſeemed to be a work which required great care, both in the choice of ſeaſon and manner of plucking, I reſolved not to depute the work to others, but to endeavour to clear a ſpot in my cow-paſture with my own hands, that, if my labour ſucceeded, I might employ others to follow the ſame method under my own eye in the reſt of this paſture.

“ Accordingly, in the evenings of the ſummer, or rather autumn, of 1762, after ſhowers, I applied myſelf to this work ; and by help of a pair of ſtrong gloves, and a tight graſp, I brought up almoſt every root, in a ſpace of about two hundred yards ſquare, whole ; ſo that I had good hopes I ſhould ſee this ſpot clear in the ſucceeding ſummer. It is true, I ſaw leaves of the ſpecies of this weed, and of a very vivid green too, around the plants which I pulled up : but as I reaſonably concluded theſe to be fed by the taws which ſpread themſelves from the main root, ſo I (methought reaſonably) concluded alſo, that this main root being deſtroyed, the ſide taws would die, and conſequently theſe young leaves.

“ But how was I diſappointed, when, in the ſummer of 1763, I ſaw this ſpot of ground as much over-run with ſeagrims as any part elſe of the paſture which had been unpulled !

“ Converſing, however, with G. Watſon, of New Malton, Eſq; towards the latter end of ſummer, on this ſubject, I was aſſured by him, that by a repetition of this labour of plucking for ſome years, he thought he had leſſened the number of his ſeagrims, though they were ſtill numerous. Urged by this example, I have gone through the whole of my paſture, which is about ten acres, and keeps five cows, at the latter end of laſt ſummer, of 1763, with the ſame care as was uſed to a ſmall part of it in 1762 ; yet am I not elated with much hope of ſucceſs ; for a little plot before my garden (in which my horſes run, and which was managed with ſtill more accuracy on account of the odious appearance of the ſeagrims from my windows) ſeems to threaten another conſiderable crop.

“ As I did not confine my enquiries about the method of deſtroying this hateful weed to any one rank of men, I was told by an honeſt quaker, a farmer in my neighbourhood, that he had found turning of ſheep in winter into his cow-paſture the only effectual method of deſtroying this hateful weed.

“ I thought this method very likely to ſucceed ; for ſheep are ſuch cloſe eaters, that I have known them deſtroy whole beds of the rankeſt docks, which could not be killed by any other means.

“ I have not been able to try this experiment conſiderably ; for, as I am raiſing quick fences, both in my meadow and paſture, I keep no ſheep. I have, however, occaſionally admitted ſome of my tenants ſheep into the ſmall plot before my garden this winter ; and, upon an accurate examination this morning, I do not entertain any ſanguine hopes of great ſucceſs from this method. I find that many of the young leaves of this weed, now level with the ſurface of the ground, are untouched by the ſheep ; and that ſuch others as appear bitten by them, do not ſeem in a dying condition.

“ The truth ſeems to me, that ſheep, though they may not have the ſame averſion to this weed as horſes and cows, yet are far from being fond of it ; and if any great ſucceſs is to be hoped for from their bite, (which may prepare beds for the water, and ſo decay the root) the ſheep ſhould be folded pretty cloſe upon it, and obliged to eat it near, and at ſuch a ſeaſon that the winter-rains may have time to work its deſtruction. And ſuch a method, if carefully purſued, ſeems to be moſt probable for the extirpation of this pernicious weed.

“ If the method of plucking is followed, I would ſubjoin ſome cautions.

“ Firſt, In order to prevent the large plants from ſeeding, I would adviſe to cut off all the tops, and the tops only, when the flowers begin to die, that then good hold of the ſtalk may be gotten.

“ Secondly, I would defer the plucking till the rains have moiſtened the ground ſufficiently to bring up the whole main root.

“ Thirdly, I recommend ſtriking the root ſo brought up againſt the ground, in order to diſperſe the earth which adheres to it, by way of manure.

“ Fourthly, I always pile the plants thus pulled up and cleanſed from earth, that, if the ſeaſon prove favourable, they may be burnt, and the aſhes ariſing from them ſpread on the ground ; or if this cannot be conveniently done, (though it is much the better method, and may, with a ſufficient fire, be done when they are ever ſo green) left to rot and manure the ſoil.

“ The groſſneſs, and even ſtench, of this weed, is a proof of the great quantity of ſalts it contains ; and in the ſame proportion as any plant exhauſts the ground of its ſalts, it repays when reduced to manure. There can, however, be no queſtion, but whilſt weeds are left to rot, a great quantity of the ſalts, which by burning would mingle with the ſoil, are carried into the air.

“ I

"I ſuppoſe your readers will be curious to know in what manner I account for the ſudden appearance of ſeagrims in vaſt abundance, in this eſtate, where they were hardly ever known before.

"I will give you an account, which, I dare ſay, you will eſteem perfectly ſatisfactory. About eight years ago I undertook to improve a piece of ground of about fourteen acres, which was over-run with thorns of both ſorts, brambles, broom, and furze.

"When I had got it cleared of all this traſh, my next buſineſs was to pare the hills off, and pile them, and, after a winter's mellowing, to break and ſpread them with a mixture of lime, and all other kinds of manure which I could collect. As the ſoil was very poor, having been exhauſted by the great quantity of traſh it had nouriſhed for many years, I was not yet ſatisfied, but reſolved to take the advantage of the firſt dry ſummer, to lead out the riches of a pond of about thirty yards long and half as many broad, which had been occupied by a great number of geeſe, &c. and never thoroughly cleaned during near thirty years. I got through this work, though at a great expence, being obliged to employ a conſiderable number of draughts, leſt the rains ſhould make the mud too thin, or the heat bake it too much, the mud being for a conſiderable ſpace a yard perpendicular.

"All this mud I laid on my newly-improved ground, except a few cart-loads, which were brought and laid by the wall of a kitchen-garden, to be mingled with the other ſoil.

"I had divided my improved ground, reſerving about four acres for meadow.

"Behold! the ſucceeding year gave me a crop of ſeagrims both in my new meadow, my new cow-paſture, and the plot of ground in which the mud for my garden had been ſcattered; and more particularly in thoſe parts where the ground had been broke, either to ſtub the thorns, &c. or to take away the hills, while the adjoining ground on every ſide was free from this pernicious weed.

"As I knew little or nothing of this weed, I ſuffered it to feed before I took any neceſſary precautions for its deſtruction. The ſucceeding year preſented me with a much larger crop, and I have been ever ſince ſtruggling for its extirpation, and have the mortification to ſee its encroachments on adjoining grounds by the ſeeds which winds have carried.

"This fact, and another of the ſame kind, in a piece of ground which I improved ſince, at ſome diſtance from the former, have confirmed me in an opinion, which I before thought very probable, viz. "That all ſoils are originally impregnated with the ſeeds of almoſt all graſſes and weeds, (though of ſome in greater quantities) which only want a proper ſtirring and manure to awaken them to vegetation, though at the expence of one another, ſome being ſuffocated by that proceſs which gives life to the others."

"I will add another ſtriking inſtance in confirmation of this ſentiment, notorious in this neighbourhood.

"A conſiderable quantity of the park at Gilling was over-run with brakes and moſs, and that wretched graſs which grows in ſuch company. Lord Fairfax, the owner, finding that he could not have his veniſon fat as it ought to be, deſtroyed his park, and applied himſelf ſeriouſly to the improvement of it at a vaſt expence. In courſe of time by due tillage he brought this worſt part of it to be not only good corn-land, but even tolerable, though coarſiſh, meadow and paſture; yet both of them thick ſet with ſeagrims, a weed never ſeen there till the quantity of lime which his lordſhip put into that poor ſoil had warmed it ſufficiently.

"I have only to add, on this ſubject, that I am perſuaded ſeagrim does more harm in meadow than paſture land; for in the latter it only exhauſts the ground, on which it ſtands, to no good purpoſe; but in the former it communicates its diſagreeable ſtench in the ſweat to the good hay, and deſtroys its ſweetneſs. I adviſe, therefore, that hay-makers be ordered to throw it with their rake-ſhafts out of the ſwathe whenever they meet with it." *Muſeum Ruſticum, vol.* V. *page* 117.

RAM, the male of the ſheep kind. *See the article* SHEEP.

A correſpondent of the editors of the Muſeum Ruſticum has obliged the world with the following method of gelding rams.

"It was, ſays he, a long time before I came into a proper method of gelding my rams: I uſed, like my neighbours, always to employ a common gelder, who cut and ſeared them; however, I obſerved that this not only put the animal to great pain, but was a conſiderable time before it healed, and the ſheep or lamb always loſt fleſh in no ſlight degree.

"Whilſt I was muſing how to improve this practice, a friend of mine, a farmer, who came accidentally to ſee me, out of Bedfordſhire, adviſed me to leave off gelding my rams in the manner I had practiſed, and, inſtead of it, to have them knitted.

"The method of doing this he deſcribed as follows. Firſt take ſome ſmall, yet ſtrong, twine, not too hard twiſted; add three of theſe together, and ſlightly twiſt them on your knee, as the ſhoemakers do their thread; than wax it well with ſhoemakers wax, and it is ready for uſe.

"When you are thus prepared, take a proper length of this twine; tie each end of it to a ſhort bit of ſtick, as thick as a walking-cane; then put it round the cod, and tying a ſingle knot, do you take hold of one ſtick and draw it, whilſt another man draws the other, as tight as you well both can; for on the tightneſs of the drawing depends the ſucceſs of the operation.

"The animal immediately loſes all ſenſe of feeling in the cod; the circulation of the blood thither is ſtopped; and if it was to be let alone, it would rot off; but this is a bad, as well as a naſty and dangerous practice, for the ſheep ſometimes die of the ſtench.

"The beſt way is, at the end of nine days, to cut off the cod; but then you muſt take a great deal of care you do not cut it too cloſe to the tying; if you do, the ſtring may chance to ſlip off, and the conſequence be dangerous, as by ſuch a neglect many ſheep may be loſt in a ſeaſon.

"Many farmers, I am informed, when they knit their rams, truſt to the ſtrength of one man's arms; and this may ſometimes be well enough, when your workman is ſtrong, attentive, and willing; but if he is failing in any of theſe points, ten to one but an accident happens: I therefore always chuſe to employ two men at this work.

"The ſeaſon I chuſe is the ſpring of the year, though ſome prefer November, after the ramming ſeaſon is over: I have many reaſons for this preference, and, particularly, I think that the warm weather coming on, hinders them from pining, or falling off their fleſh, and ſoon re-eſtabliſhes them in their perfect health. When this operation is performed in November, and the winter is either wet or froſty, the ſheep are pinched by the cold, and pine away conſiderably, not having that heartening food, to keep them in ſpirits, as they meet with in the ſpring of the year.

"I have obſerved, that if the rams are not in good fleſh, or have not been pretty well fed, they do not undergo this operation ſo well: I therefore always take care to keep them particularly well ſome time before, and alſo ſome time after the buſineſs is done. This is an attention by no means thrown away, for without it ſome miſcarriages may happen, which would otherwiſe be avoided.

"When I ſay I prefer knitting my rams in the ſpring, I mean before the hot weather comes on; as to the particular time, I am governed by the ſeaſon: if it is deferred till ſummer, the flies will ſurely be troubleſome." *Muſeum Ruſticum, vol.* IV. *page* 159.

In a ſucceeding number of the ſame work, another correſpondent has laid down the following method, which he thinks preferable to the former. He declares he has practiſed it for ten years, and in that time had not loſt a ſingle one by gelding, out of ſeveral hundreds; neither do they loſe fleſh: on the contrary, ſome of them, that did not thrive before, rather fatten better after, if the paſture does not fail. The ſucceſs he imputes to the evacuation of the humours, by cutting the ſcrotum, &c. may be the occaſion of it.

"What, ſays he, is neceſſary to be obſerved, by way of caution, is as follows. When I am about to have my lambs

lambs gelt, I take dry fresh weather to do it in; for which purpose I defer it until they are about two months old, which brings, at least, the middle of May for that work to be performed in; but, in order to have a settled state of weather, and the moon in decrease, I do it either a little sooner, or a fortnight later, when I judge the work may be done with safety, according to the above caution.

"I have the lambs put into a fold that has a good wall, or dyke, about it, by seven or eight o'clock in the morning, or as soon as the dew is off. A man is appointed to stand within the fold, with his back against the wall or dyke, who may be called the holder: another is appointed to take the lambs, one at a time, taking care not to heat them either in folding or taking them.

"When he has taken a lamb, he brings it to the holder, who takes it by the hinder houghs, and presses its back against his breast, with its head over his shoulder: the operator then, who generally is the shepherd, takes his knife, and cuts about an inch from the lower end of the cod quite off: he then puts one of his hands close up to the creature's belly, while he presses back the cod with the other; and by that means he causes the bare stones to put out, so that he can easily gripe them one at a time with his teeth, and pulls them slowly out.

"He then takes a little salt water, which is prepared on purpose, and set near him, into his mouth, and warms it a little; then he squirts it up the cod, and all is done; the holder handing the lamb over the wall, or dyke, to one that sets it on its feet on the other side, pulling its tail pretty hard when he lets it go, which makes it stretch itself out.

"Thus, in half a minute, a lamb is gelt; and in three or four days all danger is over, if kept from lying on nettles, and the like.

"It is proper to walk the lambs gently about three or four hours after they have been half a day gelt.

"If old rams are to be gelt, I do it about the same season; and the operator takes no other method than that used with the lambs, only putting a bit of salt and butter up the cod instead of squirting up a little salt water: the holder, indeed, must not now stand, but sit on the ground, griping the ram by the houghs, while he lies on his back, with his head over one of the holder's thighs, &c.

"My reasons for letting the lambs be about two months old before they are gelt, besides the reason before given, are, that at that age they are better able to bear the pain of the operation than when they are young and weakly; and the strings, as they are called, are so strong that they do not break, but come entirely out along with the stones, which makes a free passage for matter to issue out by the cod; whereas, when they are gelt very young, as is the practice with some, the *tunica albuginea*, or strings as they are vulgarly called, being but weak, they often break, probably occasioning inflammations, &c. which certainly ought to be avoided, if possible. This occasions more to die, when they are gelt young, by the operation, than when cut at two months old.

"I mentioned having the moon in decrease when I have my lambs, &c. gelt, which by some, perhaps, will be thought a circumstance not worth notice: but let such only attend to the wonderful effects the luminaries have on fluids, as well the juices of the animal œconomy, as others, when they are in the positions that constitute new and full moon; and they will, I dare say, be disposed to think the hint is not quite impertinent.

"The reasonableness of my conclusion is not deduced from argument only, but has the authority of experiment, as follows:

"I attempted to geld my lambs, one year, just at full moon: the first lamb that was cut bled very sorely; the next did the same. I tried as far as half a dozen, and none of them were otherwise. I then apprehended there was danger, so deferred cutting any more for five days, when there was a great abatement in the bleeding: besides, one of the six gelt at full moon dropt, and none of the others that were gelt five days after did, although they were above twenty times the number of the former (the weather and usage were nearly the same.) This, I own, carried conviction enough for me. Those that will not be convinced by my relation of this fact, I, notwithstanding, do heartily wish them no worse luck than I have had in that way; but withal they had as good use circumspection. *Museum Rusticum, vol. IV. page* 331.

RAMPION, the name of a beautiful flower cultivated in curious gardens.

The crimson rampion is greatly prized by the curious, for the beauty of its rich crimson flowers, which exceed all the flowers I have yet seen, in the deepness of its colour: and these commonly, when their roots are strong, produce large spikes of these flowers, which continue a long time in beauty, and make a most magnificent shew amongst other flowers. The time of their flowering is commonly in July and August; and if the autumn prove very favourable, they will sometimes produce good seeds in England. These plants are natives of Virginia and Carolina, where they grow by the sides of rivulets, and make a most beautiful appearance; from whence the seeds are often sent into England. These seeds commonly arrive here in the spring; at which time they should be sown in pots filled with light earth, and but just covered over; for, if the seeds are buried deep, they will not grow. These pots should be placed under a frame, to defend them from cold, until the season is a little advanced; but they should not be placed on an hot-bed, which will also destroy the seeds.

When the weather is warm, towards the middle of April, these pots should be placed in the open air, in a situation where they may have the morning sun till twelve o'clock, observing to water them constantly in dry weather; and, when the plants are come up, and are grown pretty strong, they should be transplanted each into a small pot filled with fresh light earth, and placed in the same situation, observing to water them in dry weather; and, in winter, they should be placed under an hot-bed frame, where they may be sheltered from severe frosts; but, in mild weather, they should be as much exposed to the open air as possible.

The March following these plants should be put into larger pots filled with the same fresh earth, and placed, as before, to the morning sun; observing to water them in dry weather, which will cause them to flower strong the autumn following.

These plants are also propagated by parting of their roots: the best season for which is, either soon after they are past flower, or in March; observing to water and manage them, as hath been directed for the seedling plants both in winter and summer. *Miller's Gard. Dict.*

RANUNCULUS, or *Crowfoot*, the name of a very beautiful flower, greatly cultivated, and much admired.

There are a great variety or species of ranunculus; but that called the Persian ranunculus being universally admired, we shall only give the method of cultivating it.

The beds in which the Persian ranunculus roots are planted, should be made with fresh light sandy earth, at least three feet deep; the best soil for them may be composed in this manner, viz. take a quantity of fresh earth from a rich upland pasture, about six inches deep, together with the green sward: this should be laid in heaps to rot, for twelve months before it is mixed, observing to turn it over very often, to sweeten it, and break the clods: to this you should add a fourth part of very rotten neat's dung, and a proportionable quantity of sea or drift sand, according as the earth is lighter or stiffer; if it be light, and inclining to a sand, there should be no sand added; but if it be an hazel loam, one load of sand will be sufficient for eight loads of earth: but if the earth is strong and heavy, the sand should be added in a greater proportion: this should be mixed six or eight months before it is used; and you should often turn it over, in order to unite their parts well together, before it is put into the beds.

The depth which this should be laid in the beds, must be about three feet; this should be below the surface, in proportion to the dryness or moisture of the place where they are situated; which, in dry ground, should be two feet eight inches below the surface, and the beds raised four inches above; but in a moist place they should be two feet four inches below, and eight above the ground; and, in this case, it will be very proper to lay some rubbish and stones at the bottom of each bed, to drain off the moisture; and if, upon this, at the bottom of the beds,

beds, some very rotten neat's dung is laid two or three inches thick, the roots will reach this in the spring, and the flowers will be the fairer. This earth I would by no means advise to be skreened very fine: only, in turning it over each time, you should be careful to break the clods, and throw out all large stones, which will be sufficient; for if it is made very fine, when the great rains in winter come on, it will cause the earth to bind into one solid lump, whereby the moisture will be detained, and the roots, not being able to extend their tender fibres, will rot.

The beds, being thus prepared, should lie a fortnight to settle, before the roots are planted, that there may be no danger of the earth settling unequally after they are planted; which would prejudice the roots, by having hollow places in some parts of the bed, to which the water would run and lodge, and so rot the roots in such places. Then having levelled the earth, laying the surface a little rounding, you should mark out the rows by a line, at about six inches distance each way, so that roots may be planted every way in straight lines; then you should open the earth with your fingers at each cross, where the roots are to be planted, about two inches deep; placing the roots exactly in the middle, with their crowns upright; then with the head of a rake, you should draw the earth upon the surface of the bed level, whereby the top of the roots will be about an inch covered with earth, which will be sufficient at first. This work should be done in dry weather, because the earth will then work better than if it were wet; but the sooner after planting there happens to be rain, the better it will be for the roots, for if it should prove dry weather long after, and the earth of the beds be very dry, the roots will be subject to mould and decay; therefore, in such a case, it will be proper to give a little water to the beds, if there should no rain happen in a fortnight's time, which is very rare at that season of the year; so that they will seldom be in danger of suffering that way.

When the roots are thus planted, there will no more be required until towards the end of November; by which time they will begin to heave the ground, and their beds appear; when you should lay a little of the same fresh earth, of which the beds were composed, about half an inch thick all over the beds, which will greatly defend the crown of the root from frost: and when you perceive the buds to break through this second covering, if it should prove a very hard frost, it will be very proper to arch the beds over with hoops, and cover them with mats, especially in the spring, when the flower buds will begin to appear; for if they are exposed to too much frost, or blighting winds, at that season, their flowers seldom open fairly, and many times their roots are destroyed: but this happens more frequently to the Persian kinds, which are tenderer, than to those sorts which are pretty hardy; for which reason they are commonly planted in open borders, intermixed with other flowers, though in very hard winters these are apt to suffer, where care is not taken to guard off the frost.

In the beginning of March the flower stems will begin to rise, at which time you should carefully clear the beds from weeds, and stir the earth with your fingers between the roots, being very careful not to injure them; this will not only make the beds appear handsome, but also greatly strengthen their flowers. When the flowers are past, and the leaves are withered, you should take up the roots, and carefully clear them from the earth; then spread them upon a mat to dry, in a shady place; after which they may be put up in bags or boxes, in a dry room, until the October following, which is the season for planting them again. *Miller's Gard. Dict.*

RAPE, the name of a plant much cultivated for its seed, and also as a food for cattle. *See the article* COLE.

RASPBERRIES, the name of a shrub, of which there are three different kinds; the common, or wild; the large red garden raspberry; and the white. They all ripen about the beginning of July.

These plants are generally propagated by slips, or suckers, but layers are far preferable, because they will be much better rooted. Their fibres should be shortened when they are transplanted; but the buds, which are placed at a small distance from the stem of the plant, must not be cut off, because they produce new shoots the following summer. A fresh strong loam in a shady situation is that in which they thrive best, and produce the fairest fruit, especially if they are planted two feet asunder every way, in borders of a moderate breadth: for if there be not room for the air to pass freely between them, they never produce their fruit in so great a quantity, nor does it grow so large, or ripen so kindly, as when they stand at sufficient distances from each other. To promote this they must be kept clear from weeds; and to let the sun in among them to ripen their fruits, their heads should be cut off just above the bearing part, a fortnight or three weeks before the fruit begins to ripen. It is upon this principle that Mr. Miller advises setting them about two feet asunder in the rows, and leaving a space of four or five feet between row and row. March is the usual time for planting them.

When they are dressed, the season for which is in October, all the old wood, which produced fruit the preceding summer, should be cut down below the surface of the ground, and the young shoots of the same year must be shortened to the length of about two feet. The intervals between the rows should then be well dug, to lay fresh earth to the roots; and if a very little rotten dung is buried therein, the plants will shoot the more vigorously in the following summer, and produce the finer fruit. During the summer, they will require no other culture than keeping them clear from weeds.

These plantations should be renewed every third or fourth year; after that their fruit dwindles greatly, both in quality and in quantity.

RAT, the name of a well known animal, very troublesome to the farmer, &c.

We shall here give the two following receipts, as they are said to be effectual, for destroying rats.

The first has the sanction of the Dublin society, who on the 19th of November 1762, ordered a premium of five guineas to one Laurence O'Hara, for this discovery; which is "one quart of oat-meal, four drops of rhodium, one grain of musk, and two nuts of nux vomica finely rasped." This mixture is to be made up in pellets, and laid in the holes and places which the rats frequent.

The other receipt is thus: "Take of the seeds of staves-acre, or louse-worth, powdered, one fourth part, and of oatmeal three parts; mix them well and make them up into a paste with honey. Lay pieces of it in the holes, and on the places frequented by rats or mice, and it will kill such of those vermin as eat thereof." *Gent. Mag. March* 1763.

The first step taken by rat-catchers, in order to clear a house, &c. of those vermin, is to allure them all together to one proper place, before they attempt to destroy them; for there is such an instinctive caution in these animals, accompanied with a surprising sagacity in discovering any cause of danger, that, if any of them be hurt, or pursued, in an unusual manner, the rest take the alarm, and become so shy and wary, that they elude all the devices and stratagems of their pursuers for some time after. This place, where the rats are to be assembled, should be some closet, or small room, into which all the openings, but one or two, may be secured: and this place should be, as near as may be, in the middle of the house, or buildings. It is the practice, therefore, to attempt to bring them all together to some such place, before any attempt be made to take them; and, even then, to avoid any violence, hurt, or fright to them, before the whole be in the power of the operator.

The means used to allure them to one place are various: one of those most easily and efficaciously practised is, the trailing some piece of their most favourite food, which should be of the kind that has the strongest scent, such as toasted cheese, or broiled red-herring, from the holes or entrances to their recesses in every part of the house, or contiguous buildings, whence it is intended to allure them. At the extremities, and in different parts of the course of this trailed tract, small quantities of meal, or any other kind of their food, should be laid, to bring the greater number into the tracks, and to encourage them to pursue it to the center place, where they are intended to be taken: at that place, where time admits of it, a more plentiful repaſt is laid for them, and the trailing repeated for two or three nights.

Beſides this trailing, and way-baiting, ſome of the moſt expert of the rat-catchers have a ſhorter, and perhaps more effectual, method of bringing them together; which is, the calling them, by making ſuch a kind of whiſtling noiſe as reſembles their own call; and by this means, with the aſſiſtance of the way-baits, they call them out of their holes, and lead them to the repaſt prepared for them at the place deſigned for taking them. But this is much more difficult to be practiſed than the art of trailing; for the learning the exact notes, or cries, of any kind of beaſts or birds, ſo as to deceive them, is a peculiar talent, not eaſily attained to in other caſes.

In the practiſing either of theſe methods, of trailing or calling, great caution muſt be uſed, by the operator, to ſuppreſs and prevent the ſcent of his feet and body from being perceived; which is done by overpowering that ſcent by others of a ſtronger nature. In order to this, the feet are to be covered with cloths rubbed over with aſſa fœtida, or other ſtrong ſmelling ſubſtances; and even oil of rhodium is ſometims uſed for this purpoſe, but ſparingly on account of its dearneſs, though it has a very alluring, as well as diſguiſing effect, as will be obſerved below. If this caution of avoiding the ſcent of the operators feet, near the track, and in the place where the rats are propoſed to be collected, be not properly obſerved, it will very much obſtruct the ſucceſs of the attempt to take them; for they are very ſhy of coming where the ſcent of human feet lies very freſh, and intimates, to their ſagacious inſtinct, the preſence of human creatures, whom they naturally dread. To the above-mentioned means of alluring by trailing, way-baiting, and calling, is added another of very material efficacy, which is, the uſe of oil of rhodium, which, like the marum lyriacum in the caſe of cats, has a very extraordinary faſcinating power on theſe animals. This oil is extremely dear, and therefore ſparingly uſed. It is exhaled in a ſmall quantity in the place, and at the entrance of it, where the rats are intended to be taken, particularly at the time when they are to be laſt brought together, in order to their deſtruction; and it is uſed alſo, by ſmearing it on the ſurface of ſome of the implements uſed in taking them by the method below deſcribed: and the effect it has in taking off their caution and dread, by the delight they appear to have in it, is very extraordinary.

It is uſual, likewiſe, for the operator to diſguiſe his figure as well as ſcent; which is done by putting on a ſort of gown or cloak, of one colour, that hides the natural form, and makes him appear like a poſt, or ſuch inanimate thing; which habit muſt likewiſe be ſcented as above, to overpower the ſmell of his perſon: and beſides this, he is to avoid all motion, till he has ſecured his point of having all the rats in his power.

When the rats are thus enticed and collected, where time is afforded, and the whole in any houſe and out-buildings are intended to be cleared away, they are ſuffered to regale on what they moſt like, which is ready prepared for them, and then to go away quietly for two or three nights; by which means thoſe, which are not allured the firſt night, are brought afterwards, either by their fellows, or the effects of the trailing, &c. and will not fail to come duly again, if they are not diſturbed or moleſted. But many of the rat-catchers make ſhorter work, and content themſelves with what can be brought together in one night or two; but this is never effectual, unleſs where the building is ſmall and entire, and the rats but few in number.

The means of taking them, when they are brought together, are various. Some entice them into a very large bag, the mouth of which is ſufficiently capacious to cover nearly the whole floor of the place where they are collected: which is done by ſmearing ſome veſſel, placed in the middle of the bag, with oil of rhodium, and laying in the bag baits of food. This bag, which before lay flat on the ground with the mouth ſpread open, is to be ſuddenly cloſed when the rats are all in it. Others drive, or fright them, by ſlight noiſes or motions, into a bag of a long form, the mouth of which, after all the rats are come in, is drawn up to the opening of the place by which they entered, all other ways of retreat being ſecured. Others, again, intoxicate or poiſon them, by mixing with the repaſt prepared for them, the coculus Indicus, or the nux vomica. A receipt for this purpoſe has appeared, which directed four ounces of the coculus Indicus, with twelve ounces of oatmeal, and two ounces of treacle or honey, made up into a moiſt paſte with ſtrong beer; but if the nux vomica be uſed, a much leſs proportion will ſerve than is here given of the coculus. Any ſimilar compoſition of theſe drugs, with that kind of food the rats are moſt fond of, and which has a ſtrong flavour, to hide that of the drugs, will equally well anſwer the end. If, indeed, the coculus Indicus be well powdered, and infuſed in the ſtrong beer for ſome time, at leaſt half the quantity here directed will ſerve as well as the quantity before-mentioned. When the rats appear to be thoroughly intoxicated with the coculus, or ſick with the nux vomica, they may be taken with the hand, and put into a bag or cage, the door of the place being firſt drawn to, leſt thoſe which have ſtrength and ſenſe remaining eſcape.

By theſe methods, well conducted, a very conſiderable part of the rats in any farm, or other houſe, and the contiguous buildings, may be taken. *Muſeum Ruſticum, vol. I. page* 395.

RAT-TAILS, excreſcences which creep from the paſtern to the middle of the ſhanks of a horſe, and are ſo called from the reſemblance they bear to the tail of a rat. Some are moiſt, others dry; the former may be treated with drying ointment and waſhes, the latter with mercurial ointment. If the hardneſs does not ſubmit to the laſt medicine, it ſhould be pared off with a knife, and dreſſed with turpentine, tar, and honey, to which verdigreaſe or white vitriol may occaſionally be added; but before the uſe of the knife you may apply this ointment.

> Take black ſope, four ounces, quick-lime, two ounces, vinegar enough to make an ointment. *Bartlet's Farriery, page* 296.

RED-CLOVER. *See the article* CLOVER.

RED-GAME, an Engliſh name of a bird, common in the mountainous parts of Yorkſhire, and ſome other of our northern counties. It is of the ſhape of a partridge, but much larger, and of a mixed colour of red and black, and is feathered down to the ends of the toes.

RED-LAND, a term much uſed by huſbandmen to expreſs a ſandy ſoil of a reddiſh hue, interſperſed for the moſt part with pieces of ſand-ſtone of the ſame colour, or ſomewhat deeper.

There are ſeveral varieties of this ſoil, one of which is almoſt entirely made up of ſand; another with an admixture of clay with the ſand, the whole making a looſe loamy earth; and a third, full of fragments, of a poor ſandy iron ore, and often containing ſhining ſpecks of ſelenitæ. *Moreton's Northamptonſhire.*

RED-WORM, the name of an inſect very deſtructive to young corn.

" I have often (ſays Mr. Baker, in his report to the Dublin Society) heard of the havock which red-worms make in young wheat, barley, and oats; and in ſome few writers upon huſbandry have read of them: but never ſaw them till May 1764; when to my great mortification, in a few days, they deſtroyed, almoſt totally, nine acres of my wheat, for I did not reap above half a barrel per acre. This misfortune induced me to propoſe to the conſideration of the Dublin Society, whether the offer of a premium might not probably produce a diſcovery of ſome effectual method for deſtroying ſo injurious an inſect, to the infinite advantage of the public: and the ſociety were pleaſed to offer a premium accordingly.

" I now have the honour to lay before them, what has occurred to me upon that ſubject.

" The moſt ingenious M. de Chateauvieux ſpeaks of an inſect, which is certainly the ſame kind, if it be not the very inſect which I have now under conſideration. This gentleman, after ſaying, " our wheat, in the month of May, 1755, ſuſtained a loſs, which even that cultivated according to the New Huſbandry did not eſcape, deſcribes the worm thus: we found in it many little white worms, which afterwards became of a cheſtnut colour. They poſt themſelves between the blades, and eat the ſtems. They are uſually found between the firſt joint and the roots; every ſtalk, which they attacked, grew no more, but became yellow, and withered. The fame misfortune happened to us in the year 1732. The infects appeared about the middle of May, and made fuch havock, that the crops were almoft deftroyed."

" It perhaps might be expected, that this great man fhould have made the very enquiry which we are now upon, as the lofs appears to have been very great in Geneva, at the two periods which he mentions: but when we confider, how much the high office, which he held in the city and republic of Geneva, muft have engaged his attention, it is rather aftonifhing, that he could oblige the world fo much as he hath done, by his repeated experiments in hufbandry, and his judicious obfervations upon them: it is therefore lefs to be wondered at, that this circumftance efcaped him.

" The ingenious Mr. Benjamin Stillingfleet alfo, in the fecond edition of his Mifcellaneous Tracts, in a note, p. 175-6, fpeaks of an infect, which is probably the fame as that which we are feeking to deftroy. His words are,

" Thus in Suffolk, and in fome parts of Norfolk, the farmers find it their intereft to encourage the breed of rooks, as the only means to free their grounds from the grub, from which the tree or blind-beetle comes, and which in its grub ftate deftroys the roots of corn and grafs, to fuch a degree, that I myfelf have feen a piece of pafture-land, where you might turn up the turf with your feet.

" Mr. Matthews, a very obferving and excellent farmer, of Wargrove in Berkfhire, told me, that the rooks one year, whilft his men were houghing a turnep field, fate down in part of it, where they were not at work, and that the crop was very fine in that part, whereas in the other part there were no turneps that year.

" We fee, that M. de Chateauvieux defcribes this worm as being firft white, and afterwards becoming of a cheftnut colour. I have carefully fought them at different periods during the paft year, but always found them of the fame cheftnut colour, never varying in any particular, except that of fize, which I find to be the cafe at all feafons, in which I have feen them.

" The infect which Mr. Stillingfleet fpeaks of, he calls a grub, which, he fays, deftroys corn and grafs: this induces me to believe, that it is the fame infect (though the report which he relates from Mr. Matthews feems to contradict it) becaufe I have obferved, that the red or cheftnut worm, never appears voluntarily upon the furface; but, when the earth is turned up, either with plough or fpade, the rooks and crows are very bold in their approach to pick them up; a circumftance, which I own has in fome degree abated my enmity to thefe birds: I therefore never deftroy nor frighten them off my land whilft I am ploughing it; but when I fow, when the corn rifes, and when it is ripe, I deftroy or banifh them as well as I can, becaufe the mifchief which they do at thofe times is intolerable.

" A member of the Dublin Society informed me laft fummer, that fome of his turneps were deftroyed by a worm; I had fome few which decayed in their leaves, and became of a lemon colour, preceding the putrefaction which followed, and deftroyed the turneps: I examined their roots, but could not difcover any infect which had injured them, and therefore I cannot pronounce that it is the red-worm which deftroyed this gentleman's turneps; but I fhall be very watchful with refpect to this circumftance, upon every opportunity which may prefent itfelf.

" I have obferved my lucerne to decay in its tops, foon after it has been up; and upon examining the roots, I have found the red-worm, which had cut them off.

" This infect feems to be every where in Ireland called the red-worm; by fome of the Englifh writers who have fpoken of an infect, which deftroys corn in the manner already mentioned; which I think is undoubtedly the fame: it is called a grub, by others the large maggot, and the rook worm, becaufe the rooks eat it; but as none of the writers have given any other defcription of it, than the name by which they refpectively call it, I fhall endeavour to defcribe it.

" Red-worms are about half an inch long, and about one tenth of an inch in diameter: they are jointed in their fkins, and are of a very firm texture: they have many fhort legs, two fmall black fpecks, which appear to be their eyes; and two fmall points fpringing from their heads, with which I believe they cut the corn; and which, in that work, I apprehend, act like forceps: and all that I have feen of this fpecies, are of a bright cheftnut colour. For this reafon, I fhould conceive it would be more defcriptive to call them the cheftnut worms.

" When they are expofed to the air, by turning up the earth which is infefted with them, they will very foon cover themfelves again in the foil, which they are very capable of doing, by the ftrength which their make gives them, although they appear to be a fluggifh infect, and have not the advantage of a fliminefs upon their fkins, which the common large creeping worm has, which enables that inoffenfive worm to penetrate the earth, and get under timber and ftones with eafe.

" The red-worm, immediately endeavouring to cover itfelf from the air, is certainly from natural inftinct, as it will foon die, when expofed to the air; as will appear by the experiment, Numb. 10, hereafter mentioned.

" Thefe worms deftroy wheat, barley, oats, and lucerne, whilft in an infant ftate, in the months of March, April, and May. Late-fown barley and oats, they will deftroy as late as June. I have not yet experienced, that they deftroy any other crops.

" The mifchief done by them is in dry weather. Rain fufficient to penetrate the ground, makes them defift from deftroying the corn; and, I fuppofe, every thing elfe which they at any time injure.

" They cut wheat off, juft above the crown of the roots; barley and oats in the fame place, and alfo higher up, upon any part of the ftem, which is below the furface of the earth.

" Thefe worms feem to abound more in ground which is lightly tilled, than in fuch as hath been well tilled; but, in lay ground, they feem to be more numerous than any where elfe: and the fields upon my farm, in which I have found them, are wetter than other fields where they are not; whether that circumftance contributes to their increafe, I cannot fay; but the following experiments prove, that they will live longer in water than they can, when expofed to the open air.

" *Experiments on Red-worms.*

" Numb. 1. I put ten red-worms into a wine-glafs with common falt in it. They were all dead in four hours.

" Numb. 2. Into a glafs with brine in it I put ten red-worms. They were all dead in fix hours.

" Numb. 3. Into a glafs with lime in it, which had been flaked for a long time, and expofed to the weather, I put the like number. They were all dead in forty-four hours.

" Numb. 4. Into a glafs with the above lime, and fome water in it, I put the like number. They were dead in twenty hours.

" Numb. 5. Into a glafs with lime newly flaked, and when cold, I put the like number. They were dead in fourteen hours.

" Numb. 6. Into lime-water, made with cold water, I put the like number. They were dead in ten hours.

" Numb. 7. Into a glafs with foot in it, I put the like number. They were dead in four hours.

" Numb. 8. Into foot and water, I put the like number. They were dead in four hours.

" Numb. 9. Into fair water, I put the like number. They were dead in fifty-two hours.

" Numb. 10. Into a glafs, without any thing in it, I put the like number. They were dead in thirty-two hours.

" By thefe experiments we fee all the articles ufed will kill this infect in a fhort time, particularly the falt and foot. I thought it neceffary to confider different articles, the better to fuit different parts of the kingdom.

" Where lime can be conveniently had, and that it is ufed as a manure, I am apt to believe, from the experiments, that no injury can be fuftained from thefe worms; but I am afraid a fmall quantity will not effectually deftroy them; befides, I fhould fear, if it were not put on before the fowing of the corn, that it might finge the blades of the corn; for, from the experiments, it appears, that lime

lime newly ſlaked, is more ſuddenly deſtructive to them than old lime, and therefore it is to be preferred.

"Where lime is uſed for no other purpoſe than to deſtroy this worm, I ſhould conceive, that about eight barrels, regularly ſown by hand on an acre of ground, might be ſufficient: it muſt be firſt ſlaked and cold before a man can poſſibly caſt it upon the ground with his hand, lime being a very ſtrong cauſtic; and, even when it is cold, the man ſhould have a thick glove upon his hand.

"Where ſalt ſhall be uſed to deſtroy this worm, it muſt always be ſown upon the ground, before the intended crop; for, although corn will vegetate, and receive benefit from ſalt as a manure, when it is uſed antecedent to the ſowing the corn, yet, if it be added after the corn is growing, it will certainly deſtroy it: and therefore, it ſhould never be uſed for this purpoſe, but before the corn is ſown, or at leaſt before it vegetates.

"I conceive that where ſalt is uſed for this purpoſe only, about four hundred and a half to an acre will anſwer the purpoſe, which is a trifle more than one ounce to every ſquare yard.

"We ſee by the experiment, that ſoot kills this worm as ſoon as ſalt; and, as in moſt places it is to be had at a much leſs price than ſalt, I think there can be no doubt about preferring of it; beſides which, it may be ſafely uſed after the corn is up.

"I had ſome ſmall parcels of barley under experiments, which theſe worms began to deſtroy; and in order to convey the ſoot as ſoon as poſſible to the roots of the plants, I mixed a little of it in water, and poured it on the plants with a garden watering-pot; the conſequence was, that I did not loſe one plant afterwards.

"It will hardly be imagined, that I mean that the ſame method is to be purſued upon a whole farm: no; the method I would recommend to the practice of the farmer is this, to ſpread or caſt by hand, as he ſows his corn, about ſix or eight barrels of ſoot on an acre, and let him be careful to chooſe a calm day for the work, otherwiſe the wind will carry away great part of it: and as what remains cannot be regularly diſpoſed, let him be careful to do it early enough in the ſpring, that the rain may waſh the ſoot and convey it to the roots of the plants, before the worm begins the miſchief; if he does this, I am perſuaded his crop will be preſerved.

"We ſee by the experiments, that this worm will live longer in water, by twenty hours, than when expoſed to the open air; but at length, i. e. in fifty-two hours, they died in the water; perhaps this might be from the effect of drowning; but if ſo, I might have expected they would have been totally deſtroyed in my two fields in the winter of 1763 and 1764, by the immoderate rains which fell at that ſeaſon for a long continuance, by which the land was often flooded. But they ſurvived that winter, as appeared by the great loſs I afterwards ſuſtained, by their deſtroying my wheat; and therefore, whether water be an enemy to them or not, it ſeems not eaſy to determine: but if theſe which died in the glaſs of water were really drowned; yet, I think we may conclude, that water is neceſſary to their exiſtence in the earth, and propably aids them in getting their food from it: and what ſeems to confirm this notion is, that when the land is wet, they do not touch the corn, but as ſoon as ever the land is dry, they begin their miſchief. However, this ſpeculation I muſt ſubmit to the conſideration of perſons more capable of diſcuſſing it than I am.

"We ſee by the experiment, Numb. 10, that they cannot live in the open air; which ſeems to prove, that, where they abound in land, the oftener it is ploughed, particularly in the ſummer, when they cannot penetrate the ground ſo eaſily as when it is moiſt, they muſt be, by ſuch ploughing, greatly diminiſhed; beſides which, the frequent ploughing gives the crows more opportunities of picking them up, in which, as I before ſaid, they are very watchful.

"Frequent ploughing has been recommended by ſome writers, as the only means of deſtroying this worm; and they have recommended the ploughs being ſtuck with nails, urging, that by thoſe nails the worms are cut to pieces; others have recommended walnut leaves being ſoaked in water, to ſprinkle the land; and ſteeping ſeed-corn in various liquors, as infallible remedies: but ſuch methods as theſe are founded upon miſtaken principles; they only miſlead the farmer, and muſt diſappoint him.

"Worlidge recommends a ſtrong lye made of fixed ſalts, but that would be impracticable. Mortimer recommends ſea-water, for ſuch lands as are near the ſea-coaſt, which I believe would anſwer very well. He ſays he uſed ſoot once with ſucceſs, but that it did not ſucceed with him afterwards. I am perſuaded he did not uſe the ſoot early enough to have it waſhed into the ground by rain, or perhaps he uſed too ſmall a quantity.

"I would not be thought to arrogate any merit to myſelf, on account of what I have here offered, on this ſubject, ſince it appears, that other perſons have uſed the articles which I have recommended, againſt this common enemy; but many perſons have been diſappointed in their expectations from theſe remedies, which muſt have ariſen from their either having uſed too ſmall a quantity, or not having obſerved the neceſſary precautions; if thoſe, which I have recommended, ſhall be put in practice, and found to anſwer, I ſhall think myſelf amply rewarded."

REEK. *See the article* STACK.

REEK-STAVEL, *or* REEK-STAFFOLD, a frame of wood placed on ſtones, on which the mow or ſtack is raiſed.

REED, the name of an aquatic plant, infeſting low paſture lands.

The beſt method of deſtroying reeds, is by draining the land; for if the drains be cut deeper than their roots, it will take away their nouriſhment, and, conſequently, deſtroy them. Aſhes, or ſoot, will likewiſe kill them; and ſo will ploughing up the land, and laying it in high ridges. They always indicate a good ſoil, for a bad one will not nouriſh them.

RESERVOIR, a baſon, or receptacle for water. *See the article* BASON.

REY-*graſs*, a hardy ſort of graſs, much eſteemed among the farmers for that quality. It will grow on any land, and therefore produces crops where nothing elſe will. It thrives beſt of all on ſour, clayey, and weeping grounds, and equally endures the ſevereſt droughts of ſummer, and froſts of winter, ſuffering no damage from either. It is the beſt of all winter foods for cattle, the ſhorter it is eaten the better, and it ſprings the earlieſt of any. There is no danger of over-ſtocking it, for, if it be left to grow too much, the ſtalk becomes hard and ſticky. It is beſt for horſes and for ſheep, and very much prevents the rotting of the latter. The beſt way of ſowing it is with clover. The common quantity of ſeed is two buſhels to an acre, but three buſhels is much better; though in ſome lands, where the clover is likely to ſucceed very well, they ſow eight pounds of clover ſeed and one buſhel of rey-ſeed to an acre, and this makes a crop that will laſt ſeven or eight years.

Some mow it as hay, and thraſh it for the ſeed, which, about London, ſells from half-a-crown a buſhel to three ſhillings. Four or five quarters of this ſeed will be ſometimes produced from an acre of the graſs. If at any time a field of this graſs is found to grow thin, it is only neceſſary to ſtrew on a buſhel of the ſeed, and roll it with a wooden roller, and the plants riſing from this addition will make the whole crop ſufficiently thick. Rey graſs has this great advantage, that it kills weeds without any other ſown plant; even thiſtles cannot grow among it. When the rey-graſs is cut for hay before perfectly ripe, the hay is the better; but the ſeed will not grow ſo well. When the ſeed is newly thraſhed, it muſt not be laid too thick, for it is very apt to heat and ferment, and the whole will be ſpoiled. *Mortimer's Huſbandry, vol.* I. *pag.* 40.

RICE, the name of a plant cultivated in many parts of the eaſt, in South-Carolina, and alſo in Spain, Italy, and Piedmont.

The plant grows to the height of about two feet and a half, with a ſtalk not unlike that of wheat, but fuller of joints, and with leaves reſembling thoſe of a leek. It branches out into ſeveral ſtems, at the top of which the grains grow in cluſters, and each of them is terminated with an arum or beard, and incloſed in a yellow rough huſk. When ſtripped of this they appear to be of an oval ſhape, of a ſhining white colour, and almoſt tranſparent.

The following account of the culture of rice in China, is taken from M. Duhamel's Husbandry.

" 1. To hasten the sprouting of the rice, it is put into baskets, and soaked for some days in a standing water.

" 2. When their rice grounds are so soaked with water as to be quite like mud, they plow them with a buffalo yoked to a plough very simple in its make, having but one share, one handle, and no wheels.

" 3. After a gentle rain, they break the clods with a kind of large hurdle, drawn by a buffalo; the driver sitting upon it, to increase the weight.

" 4. The ground is cleared of all stones, and whatever roots are in it are pulled up by a strong harrow, with great iron teeth. This instrument is drawn by a buffalo, and a man guides it with the help of two handles, like those of a plough, upon which he leans hard. The earth is like mud, and partly covered with water during all this operation.

" 5. The earth is afterwards smoothed with a harrow, which has several rows of teeth. A man guides this harrow by its two handles, whilst a buffalo draws it; and as fast as its teeth form little channels in the ground, the water runs in, and fills them up.

" 6. When the rice that was laid to soak has sprouted, the seed is known to be good; and it is then sown by hand, very thick, and as equally as possible. Only part of the ground is sown in this manner, to furnish plants for the rest.

" The day after it has been sown, the points of the plants appear above the surface of the water: for the ground is overflowed all this time with just enough water to cover it.

" 7. When the plants have acquired a little strength, they are sprinkled with lime water, to destroy the insects and some of the weeds that would hurt them. For this purpose a small basket is fastened to the end of a long handle, and dipt in the lime-water, which runs through it, as it is conveyed over the plants.

" The Chinese have a great veneration for the first inventor of this method, which answers to our custom of steeping wheat in lime-water, or manuring land with quick-lime.

" 8. Towards April, when the plants are grown strong enough to cover the whole field, and look very green and even, the greatest part of them is pulled up by handfuls, all the mud is carefully washed off their roots, and, being held all this time as even as possible with one another, they are planted in tufts, pretty far asunder, and in a quincunx form, in fields prepared on purpose for them. A serene day is chosen for this operation, which must be performed as quick as possible.

" This practice of the Chinese is with respect to the common culture of rice, what the new husbandry is with respect to the common culture of wheat.

" 9. The rice must be watered: which is always done in China, by overflowing it. To this end, the rice grounds are always near a rivulet, pond, or great pool of water, from which they are separated only by a bank or causey.

" If the water was higher than the rice ground, a trench cut through the causey would overflow it at once: but as it is generally lower, or on a level with the rice ground, the necessary quantity is conveyed in pails or buckets, which are worked chiefly by the help of ropes.

" 10. Though a man cannot step in these rice grounds without being up to his knees, the Chinese weed them three times in a summer; and that with such care, that they pull up even the roots of every weed.

" 11. When the rice is ripe, which is known by its turning yellow like wheat, it is cut down with a sickle, made into sheaves, and carried to a barn, where it is threshed with flails pretty much like ours: the straw is removed with pitch-forks and shovels, and the outer husk of the grain is taken off by beating it with great wooden pestles, or a kind of mallet, after which it is sifted and winnowed: and, lastly, to get off the under husk, the grain is put between two mill-stones, which are worked by a lever fastened to the upper one.

" The two most remarkable circumstances of this culture are, 1. The care which the Chinese take not to let their plants be too close together, lest they should rob one another of their food. 2. Their weeding their rice grounds three times in a summer, which answers the end of the hoeings recommended for the alleys between the beds of other grain, cultivated according to the new husbandry." *Culture des Terres, Tom. II. p.* 180.

RICK, a pile of corn, hay, straw, &c. regularly heaped up in the open air, and sheltered from wet. *See* STACK.

A practical farmer has given the following account of the benefits arising to the farmer from keeping his wheat-straw in ricks, to be used when occasion requires it.

" Experience will, they say, make a fool wise: I took the hint, and have ever since guarded against a misfortune of the like nature.

" I constantly, says he, every year make a rick of wheat straw, unless it happens to be very short, when I keep my rick two years, instead of making a new one the second year.

" This may, and doubtless will, by some of your readers, be thought an unnecessary expence; yet, as I find it answer, I am determined to continue the practice. I not only rick the straw, but I also slightly thatch the rick to keep out the weather; yet, after all, I save by it.

" As I keep a very regular account of my farming expences, I find that in the space of ten years I am a gainer of fifty-three pounds, by saving in this manner a rick of straw for thatching, besides what I saved by not threshing my wheat at an improper season. When I say I am a gainer of so much money in the time, I mean a clear gain: after deducting the expences of making up the rick, thatching it, &c. my expences in thatching for the last ten years have been fifty-three pounds less than they were the ten preceding years; and this I can easily account for, and will, for the satisfaction of your readers, at least in part, do it.

" I now always do my thatching work at the most convenient season, being never in want of straw; and, for the same reason, as soon as any part of my thatching is deficient, I have it immediately repaired, which is a great saving.

" My thatching now lasts longer than it used to do, for I never thatch with short straw, having always, as I observed before, long straw to use; for in the years when the straw is long, I save the largest rick, which I have sometimes kept two or three years, till the wheat straw has been again long.

" In the space of the last ten years I had two accidents happened, which would have proved very expensive to me, if I could not have resorted to my straw rick.

" The first was, that one of my sons (a boy about ten years of age at the time) set fire to the thatch of a large barn, by means of a squib. It burnt furiously for some time, and so far damaged the roof, that I was obliged to have it new thatched; for which purpose I made use of a part of my straw rick, and it was finished in a few days; whereas, if I had not had this rick, I must have bought short straw, for there was scarcely any other to be had, at a large price, and the thatching could not have been finished so soon; by which means I should have had a considerable quantity of barley, that was in the barn, damaged, for it rained very hard, for a considerable time, in a few days after the thatch was repaired.

" The other accident was occasioned by a gust of wind which stripped off a good deal of thatch; but it was soon repaired, without any damage to the corn that was in the barns at the time.

" All this, perhaps, will not be enough to persuade your practical readers to rick their long straw. If this is the case, they must even continue their old practices: yet I hope I may be permitted to say one thing, which I know to be true; what I mean is this, that farmers, if they would attend to matters which they generally think beneath their consideration, would get more money than they do: profits arise from what appear to be trifles at first sight, and the merest trifle should be by a farmer attended to.

" A habit of industry, frugality, œconomy, and perseverance, is absolutely necessary to the occupier of land, if he does not mean soon to shift his quarters. *Museum Rusticum, vol.* III. *page* 245.

RIDDLE, an oblong sort of sieve used to separate dust, and the seeds of plants from corn.

RIDE, a clufter of fprigs of hazel, or the underwood, fhooting out of the fame root.

RIDGE, a long piece of rifing land between two furrows.

Mr. Tull obferves, that the method of ploughing lands up into ridges is a particular kind of tillage, the chief ufe of which is the alteration it makes in the degrees of heat and moifture. But the principal advantage this gentleman propofes from ridges is the draining wet hills, where the upper ftratum is mould, and the fecond ftratum clay. Thefe ridges he obferves fhould be plowed acrofs the hill, almoft horizontally, that their parting furrows lying open, may each ferve as a drain to the ridge next below it; for when the plough has made the bottom of thefe horizontal furrows a few inches deeper than the furface of the clay, the water will run to their ends very fecurely, without rifing into the mould, provided no part of the furrows be lower than their ends. Thefe ridges and their parting furrows muft be made more or lefs oblique, according to the form and declivity of the hill; but the more horizontal they are, the fooner the rain-water will run off the lands: for in that cafe, it will run to the furrows, and reach them at right angles. Every one of thefe horizontal trenches receives all the water from the rills, or little gutters, which in thefe quagmire-hills run betwixt the mould and the clay; thefe are all cut off by the trenches, which receives the water at their upper fides, and carry it away, as the gutters of lead, placed under the eaves of a houfe, carry away the rain-water. Thefe ridges fhould be plowed in pairs, without throwing any earth into the trenches; and at every time of ploughing, the pairs muft be changed, fo that the furrow which had two ridges turned towards it one time, muft have two turned from it the next. *See the article* PLOUGHING.

RIDGES *in a Horfe's Mouth*, are wrinkles or rifings of flefh in the roof of the mouth, running acrofs from one fide of the jaw to the other, with furrows between them.

RIDGLING, the male of any beaft that has been half caftrated.

RING-BONE, a hard fwelling on the lower part of the paftern of a horfe, and generally reaches half round the forepart. It has its name from the refemblance to a ring.

It often arifes from ftrains, &c. and, when behind, from putting young horfes too early upon their haunches; for in that attitude a horfe throws his whole weight as much, if not more, upon his pafterns, than on his hocks.

When it appears diftinctly round the paftern, and does not run downwards toward the coronet, fo as to affect the coffin-joint, it is eafily cured; but if it takes its origin from fome ftrain or defect in the joint originally, or if a callofity is found under the round ligament that covers that joint, the cure is generally dubious, and fometimes impracticable; as it is apt to turn to a quittor, and in the end to form an ulcer upon the hoof.

The ring-bones that appear on colts and young horfes, will often infenfibly wear off of themfelves, without the help of any application; but when the fubftance remains, there needs no other remedy befides bliftering, unlefs when by long continuance it is grown to an obftinate hardnefs, and then it may require both bliftering and firing.

To fire a ring-bone fuccefsfully, let the operation be performed with a thinner inftrument than the common one, and let the lines or razes be made not above a quarter of an inch diftant, croffing them obliquely, fomewhat like a chain; apply a mild blifter over all, and when quite dried up, the rupture plaifter; and then turn the horfe to grafs for fome time. *Bartlet's Farriery, page* 264.

RIPPLING *of Flax*, the operation of taking off the feed from the flax by drawing it through a ripple, or large comb. *See the article* FLAX.

RISING, yeaft, or barm.

RIVER, a current, or ftream of frefh water flowing in a bed, or channel, from its fource into the fea.

RIVULET, a little river or fmall ftream of water.

ROD, a meafure in length, confifting of fixteen feet and a half.

ROLLER, a large piece of wood turning on its axis, and drawn over the furface of the ground to break the fmall clods, and render it fmooth and even.

Spiky ROLLER. *See* SPIKY ROLLER.

ROLLING, the operation of drawing a roller over the furface of the ground.

"Rolling, as well as ploughing and harrowing, fays Mr. Clarke, if admitted in the culture of fallow-lands, would, I prefume, much facilitate eradicating of weeds, and promote the prolific capacity; for it often happens, that after land has been ploughed and worked with the great harrow, &c. there ftill are grafs and weeds remaining, that will the next ploughing caufe the furrows to be ropy, and then much labour and time is required to make it to the mind of the judicious hufbandman, which rolling in the following order will be found to elude.

"Thus, when the land has been once ploughed, bracked, and harrowed, immediately give it a double rolling with a ftone cylinder about four feet long and three feet radius, which, with its furniture, is a roller about one ton weight: the preffure of fuch roller, when there is little moifture in the land, fixes it fo much, that no weeds nor grafs can vegetate: next, in about a month after, put in manure by another ploughing, viz. dung or compoft, whereof dung is the major part; but lime is at this time very improper, as it refifts putrefaction: then give the land a ftroke with the great harrow, and roll it as before: this puts the manure, foil, and juices in contact; by which, together with the vivifying heat of the fun, (that muft be greater on rolled land than on loofe, rough, unfteady particles of earth, becaufe it thereby becomes quiefcent, and the furface acquires a kind of polifh) fermentation and putrefaction muft be ardently excited.

"That thefe are falubrious and moft powerful agents in the fertilifing of land, by loofening the compaffes, and fetting at liberty the more fubtile parts of the manure and foil, and generating that fort of air which is found fo neceffary to animal as well as vegetable life, none converfant in thefe matters can make the leaft doubt.

"Now, indeed, may a quantity of quick-lime be applied to great advantage, by being fpread on the furface; for the weeds that are harrowed up, will not only foon be diffolved by it, and converted into nourifhment for vegetables; but the very principle of vegetation, which is going off in exhalations by the effervefcence within, is by it abforbed, and retained for the nutrition of the crop, which it will communicate when it is ploughed in; and that may be done about fourteen or twenty days after, fooner or later, as the weather anfwers, or the experimentor fees it neceffary: and if it is a foil fit to grow turneps, and the feafon proper, the feed may be fown immediately, either in the drill or common way; but the drill, on many accounts, in fowing turneps, deferves precedency; or, if it is to be winter corn, one ploughing more, which is the third only, makes it in fine order for the feed.

"The utility of rolling does not end here neither; for to roll wheat, rye, barley, &c. with a roller about twice the length, and half the weight of the one above defcribed, may be advantageous, as it preffes down the foil, that has been raifed by the frofts, about the minute ramifications of the attracting ducts, and augments the quantity of mould upon them by breaking the little lumps of foil, which, indeed, were very ferviceable in winter, by affording fhelter, but in fpring will be of ftill greater ufe, by fuch imminution, in filling up the fiffures, and preventing, in a great meafure, the ill effects droughts have on light foils, by retaining and filtering rain water; whereby the foil imbibes whatever is nutritive, what is fuperfluous of the fimple fluid only efcapes.

"Thefe are fome of the many advantages rolling produces in agriculture; notwithftanding which, it amounts to more than mere conjecture, that in general rolling corn may do more damage than it can do good, if fuch as the following cautions be not carefully attended to, viz. Never to roll corn but in dry, frefh weather; by no means ufe heavy rollers, nor roll too early, i. e. before the blades be pretty ftrong, for the wounds that the blades may receive, the roots, being then tender, will be unable ever to recover; nor too late, i. e. when the ftalks are hardened and grown any height, for the roller will break them, which injury hardly can be repaired, and the crop is thereby hurt; that none but light lands are proper to be be rolled, and those only which have been manured that or the preceding year with dung: in short, none but rich, light soils, in general, can be improved by rolling; for in poor lands it opposes the most active primogeneous agents, and undoes all that has been done for the crop by ploughing, &c.

"Thus the soil, the condition, the growth of the corn, the weather, and the weight of the roller, are all to be most scrupulously regarded: when all coincide, the advantages of rolling will be great; but when they do not, the disadvantages may be insuperable.

"Rolling, then, is neither the least critical, nor most insignificant piece of the husbandman's profession; therefore ought not to be performed at random and without circumspection. *Museum Rusticum, vol.* IV. *page* 5.

Rolling it also of use to land in grass, by pressing down mole-hills, &c. It also makes the grass tiller, and grow thicker.

There is a sort of land, which, when clover is sown upon it, throws out the young plants after a frost. Rolling in the beginning of winter, and immediately after the frost is gone, will, in some measure, prevent this. The first rolling hinders the frost from penetrating so deep as it would otherwise do; and the second makes the land firm, after having been loosened by the change from frost to open weather.

ROOD, a quantity of land equal to forty square poles or perches, that is, a quarter of an acre.

ROOK, a well-known bird, resembling a crow; but feeds on grain, insects, &c.

Great care should be taken to guard against these mischievous birds at the time when the wheat is just shooting up; for they perceive its shooting much sooner than the farmer can, and are led by the shoot to pick it up. They must, therefore, be carefully kept off the ground about a week or ten days after this season; for at the end of that time the blade will be grown up, and the grain so exhausted of its substance, that they will not give themselves any trouble about stealing it. They never molest the wheat which is sown about Michaelmas; because so much grain of the late harvest then lies scattered about the fields, that they find it much easier to pick up that, than to search for corn under ground in new-sown lands. They do most harm when the snow is first going off from the green wheat, towards the end of winter; for having been pinched for food during that season, they then greedily pluck up the young plants, in order to come at the remainder of the seeds still adhering to their roots; and are greatly assisted in this by the loose state of the earth at that time.

Among the many contrivances to frighten them away, such as feathers stuck up, the limbs of rooks scattered about the ground, dead rooks hung on sticks, the gun, a boy to halloo and throw his hat, or to toss a dead rook up in the air, Mr. Tull says he found this last to be the most effectual. They will immediately quit their usual places of abode, if the earth is turned up around the trees, in which they have built their nests, and will not return to them till the grass is grown again; as was lately experienced in the repairing of Fountain-court in the Temple: Mr. Lisle assures us, that the taking down of their nests, with their young ones in them, and burning under the trees they were built in, will effectually make all the old ones desert that place. However, it has been doubted, and perhaps with reason, whether they do not, upon the whole, compensate pretty fully, for the mischief they do to corn, by destroying vast quantities of grubs, worms, and other pernicious insects, in the spring: as crows are also of service in the neighbourhood of populous towns, by devouring a great deal of carrion.

It is a common proverbial saying of the countrymen, that at whatsoever farm a colony of rooks plant themselves, and make a rookery, it is a sign of prosperity to the occupier of that land; and that, on the contrary, their deserting it, betides misfortunes and poverty: for both which remarks, Mr. Lisle accounts very rationally, by observing, that where a man is a good husbandman to his land, and improves it, the worms, which are a great food to these creatures, especially at certain times of the year, multiply, and grow to a much greater bulk and fatness, than in a poor neglected soil; the strength of land being as discernable by the large size of worms, as from the growth of plants; and that the grubs or maggots of the beetle kind in particular, on which the rooks feed greatly, as is apparent from their following the plough, in order to pick them up, not only grow fattest and largest in rich well tilled ground; but that the beetles themselves, while in their state of flies, always choose to lay their eggs in such land as will best nourish and provide for their young. The contrary to this soon happens under a bad husbandman.

ROOKERY, a nursery of rooks, or place where they build their nests.

ROOP, hoarseness.

ROOT, the lower part of a plant, by which it adheres to the earth, and by which it draws its nourishment, and transmits the juices to the other parts. For the method of clearing land from the roots, *see the article* GRUBBING.

ROSIL, or *Rosills*, land neither light nor heavy, being a medium between sand and clay.

ROSACEOUS, an epithet applied to such flowers, as are composed of several petals or leaves, disposed in a sort of circular form, like those of the rose; of this kind are the flowers of the piony, ranunculus, unquefoil, &c.

ROSE, the name of a well known beautiful plant, and of which there are numerous varieties.

All sorts of roses are propagated either by suckers or layers; the best season for laying is in October, which is also the proper time for planting, though in moist land the spring is nearly as proper.

ROSEMARY, the name of an odoriferous plant very common in almost every garden.

Rosemary may be raised from seeds; but it is more commonly, and more easily propagated by planting slips or cuttings of it in a spot of fresh light earth, in the spring of the year, just before its buds begin to open. When these plants have taken root, till which they must be watered gently from time to time, and shaded if the sun be too powerful, they should be transplanted into the places where they are to remain. This should be done early in September, that they may have time to strike out new roots before they can be in danger of being hurt by frosts; for those which are set too late in the autumn seldom live thro' the winter, especially if the weather prove very cold. Rather than do this, it is better to let them stand till the next ensuing March, and then to remove them after the hard weather is over: but in whatever season they are transplanted, it should not be during a cold drying easterly wind; because this would soon shrivel up their leaves, and kill them. If a few warm showers fall soon after they are set, they will soon take root, and after that they will require no farther care, than keeping them free from weeds. The distances between the plants should be full sufficient to allow for their utmost growth, so that they may not touch one another. That growth will be most luxuriant, especially in the summer, if they are set in a rich mould: but then they will be most subject to be injured by frosts; nor will their odour be near so strongly aromatic, as when they are raised on a poor gravelly soil.

ROT, a disease incident to sheep, arising frequently from wet seasons, and too moist pasture.

"But the rot in sheep, says an ingenious and practical writer, does not always proceed either from moisture alone, or the nature of the soil alone; for all moist grounds do not cause the rot in sheep, and there are some lands which rot sheep in wet years only.

"The rot, in fact, arises from a certain putrefaction, both in the air, and in the grass or herbs that usually grow in such moist years: these, together with their moist food, corrupt their livers, and bring on the disease.

"It is indeed very difficult to cure this disorder, unless it is attempted before the liver is too much wasted: where there is a convenience of doing it, the best remedy is, an immediate removal to salt-marshes; but this is far from being in every farmer's power: I shall endeavour therefore, from my own former experience, to supply the deficiency.

"In such cases as these, a prevention of the evil is to be recommended to the practice of every rational farmer.

"Some grounds naturally yield a soft, spungy grass, which is, more than any other, subject to breed the rot in sheep; I would therefore advise, that other cattle be fed in these grounds, and the sheep kept in the driest, hardest, and healthiest pastures.

"I have known land that has kept ſheep in health for many ſucceſſive years, yet afterwards, when the months of May and June have proved wet, a frim and frothy graſs has ſuddenly ſprung up, which, together with the bad air that muſt of courſe follow, has cauſed a rot in the ſheep that were then on it: the evil was obſerved in time, the ſheep were removed to a dry and almoſt barren heath, and in the ſucceeding winter they were foddered with good, dry, ſweet hay, and a great loſs was prevented: this happened to an old friend of mine, ſince dead.

"This unwholſome graſs is moſt apt to grow in cold land, and in the ſummer-time; and it is a general opinion, and well founded on experience, that if the ſummer does not rot ſheep, the winter will not, the power of the winter alone not being ſtrong enough to begin a rot.

"A very ſenſible writer, whoſe book I have juſt turned to, I mean Mr. Liſle, ſays, that broom is very good for the rot; and indeed I have often experienced it; for in a farm I occupied ſome years ago there were ſeveral broom-fields, and I have often obſerved that ſuch of my ſheep as were part of the year fed in them were never infected with the rot, whilſt others in my poſſeſſion had it to a great degree. I profited however by experience, for I took care thenceforward that all my ſheep ſhould, by turns, enjoy the advantages to be derived from their feeding on the young ſhoots of the broom.

"As to what Mr. Liſle ſays, on the authority of Mr. Ray, that the marſh-trefoil will cure the rot, I cannot, from experience, corroborate it: I have heard its efficacy in this diſorder often mentioned, but never yet heard any particular fact related ſo circumſtantially as to induce me to depend on its effects.

"That ſalt is good, I agree with the above gentleman and Mr. Boyle; and this gives me an opportunity of communicating a receipt which I know to be a good one.

"When you perceive, by the colour of your ſheep's eyes, that the rot has taken them, drive your flock into a barn, a covered fold, or ſome ſuch convenient place: around this place let there be wooden troughs, like mangers, in which you ſhould feed your ſheep with good, dry, clean oats, for forty-eight hours: then have ready ſome bay ſalt finely powdered and ſearced, of which you are to ſprinkle a little among the oats, encreaſing the quantity till it diſguſts the ſheep, and you perceive they fall off their appetites: afterwards, for the two following days, give them again clean oats; and then mix your ſalt with them as before, continuing this proceſs till their eyes have recovered their natural colour, when you will find them perfectly cured; and to be convinced, it will only be neceſſary to kill one or two out of the flock.

"To this I ſhall add a receipt for the rot in ſheep, which was communicated to me by a friend, a man of credit and veracity, who ſays he has often tried it with ſucceſs.

> "Steep ſome regulus of antimony in ale, adding thereto ſome grains of paradiſe, and a little ſugar to ſweeten it. Of this infuſion ſomewhat leſs than a gill is to be given to every one of your affected ſheep; they are to have two or three doſes, according as they are more or leſs affected by the diſtemper, allowing two days intermiſſion between each doſe."

"This is ſaid, as I have already obſerved, to be a cure almoſt certain.

"I juſt now take notice, that when rain falls in the months of May and June it is apt to cauſe the rot in ſheep: it will be neceſſary to add, that folding them in the above months encreaſes the diſorder; for after having been deprived of their liberty during the whole night, they bite the noxious graſs the more greedily in the morning, having leſs ceremony in their choice of herbs than if they were not folded. This is a matter of ſome conſequence, therefore worthy of being attended to.

"One thing more I muſt, on the authority of Mr. Liſle, communicate to your readers, viz. an obſervation of a Leiceſterſhire farmer; that ſheep, when firſt touched with the rot, will thrive mightily in fatting for ten weeks; but if they are not diſpoſed of when they are come up to a pitch, they will, in ſeven or eight days time, fall away to nothing but ſkin and bone. The ſame farmer obſerved, that he had often had them die in the height of their pitch, in half an hour's time, with twenty-ſeven pounds of tallow in their bellies." *Muſeum Ruſticum, vol.* I. *pag.* 434.

To this account we ſhall add a receipt communicated to Mr. Mills by a gentleman of Lincolnſhire.

> "Steep a handful of rue in a pail of water all night, and at morning put in as much ſalt as will make it bear an egg. Give each ſheep half a pint of this liquor, and repeat it thrice, every other morning.

"A farmer who kept four hundred ſheep tried this receipt in the laſt general rot (about five years ago), and did not looſe any, though his neighbours loſt almoſt all theirs. For the ſake of the experiment, he ſet apart about twenty, and did not give them this drink. Many of theſe were rotten." *Mills's Huſbandry, vol.* III. *p.* 416.

Buck-bean, or marſh-trefoil, is alſo excellent in this diſtemper. *See the article* BUCK-BEAN.

ROUGHINGS, latter-graſs, aftermaths.

ROUP, the name of a filthy diſeaſe in poultry, conſiſting of a boil or ſwelling upon the rump, and is known by the ſtaring, or turning back of the feathers.

The roup, if not ſoon remedied, will corrupt the whole body of the fowl; to prevent which the feathers ſhould be plucked away, the ſwelling laid open, and the matter preſſed out; after which the part is to be waſhed with brine, or ſalt and water.

ROWEL, a kind of iſſue made in horſes for the cure of various diſorders, as inward ſtrains, hard ſwellings, &c.

The operation is performed in the following manner:

A little ſlit being made through the ſkin, about a handbreadth below the part aggrieved, big enough to put a ſwan's quill in, the ſkin is raiſed from the fleſh, the end of the quill put in, and the ſkin blowed from the fleſh upwards, and all over the ſhoulder; then, the hole being ſtopped with the finger, the part blown is beat with a hazle-ſtick, and the wind ſpread with the hand all over, and then let go; this done, a ſkain of horſe-hair, or red ſarſenet, half the thickneſs of the little finger, is put in a rowelling-needle, ſeven or eight inches long, and the needle is put into the hole, and drawn through again, ſix or ſeven inches higher; then the needle is drawn out, and the two ends of the rowel tied together, anointing it every day, as well as before the putting it in, with ſweet butter and hog's greaſe, and drawing it backwards and forwards in the ſkin, to make the putrid matter diſcharge itſelf more plentifully.

Others, diſliking theſe rowels, as making too large a ſore and ſcar, uſe the French rowel, which is a round piece of ſtiff leather, with a hole in the midſt, laying it flat between the fleſh and ſkin, the hole in the rowel juſt againſt that in the ſkin, ſewing it with a needle and thread drawn through the hole and the ſkin, cleaning it once in two or three days, and then anointing it afreſh.

"The general and abſurd reaſoning of farriers, ſays Mr. Bartlet, on the effects and uſe of rowelling, makes the following obſervations the more neceſſary, as it is too notorious how impertinently they talk on this ſubject: for in ſhort with them, a rowel is to draw off all the bad and corrupt humours from the blood, by a ſort of magick.

"It is neceſſary to obſerve that the matter generally diſcharged by a rowel, is nothing more, than an ouzing from the extremities of the veſſels divided in the making of it; in fact then, it is blood, which loſes its colour, by being ſhed out of the veſſels, the warmth of the part, and its confinement.

"If this is granted, it will evidently appear, that the good effects enſuing this operation, muſt be owing to a gradual depletion, or emptying of the veſſels in general; by which means the ſurchage or load on a particular part, is taken off and removed; and impurities or bad juices (generally called humours) run off with the good, in proportion to their quantity in the blood.

"To imagine particular humours are thus ſeparately, and alone diſcharged from the blood, through theſe orifices, is an opinion but too generally received, though a very abſurd one; and muſt be very pernicious in its conſequences, from the bad effects it may have in practice; as muſt the ſame reaſoning alſo in regard to purging.

"The

"Thus to lean hide-bound horfes, and thofe of a dry hot conftitution, the difcharge, by depriving the conftitution of fo much blood, and fluids, is daily exhaufting the ftrength of the animal; and may be productive of bad confequences, by defrauding the conftitution of a neceffary fluid.

"But in diforders from fullnefs, attended with acrimony, or fharpnefs of the juices, and with defluxions on the eyes, lungs, or any part of confequence; the gradual difcharge brought on by thefe means, will contribute to leffen the fullnefs on the parts affected, and give the veffels an opportunity of recovering their tone, while evacuating and alterative medicines are doing their office.

"It may be neceffary however to obferve, that there is a wonderful communication between the veffels of the cellular membrane under the fkin, which remarkably appears, by inflating thofe of fheep, calves, &c. by the butchers; hence probably it is that fome diforders of this integument, are fo apparently relieved by iffues, or rowels, without our having any recourfe to that general depletion of the veffels we have juft obferved, to account for it; and hence alfo may be deduced their utility, fometimes in draining off any extravafated fluids, which may lodge between the interftices of the mufcles, after violent ftrains of the fhoulder; alfo in difcharging fuch vicious, or fharp fluids, as are thrown on the membranes, and occafion thofe flying pains and lameneffes, which we find are often removed by this local remedy." *Bartlet's Farriery, page* 220.

ROWEN, *or* ROWET, winter-grafs.

ROWTY, over-rank, too ftrong.

RUDDLE, a fort of red earth, of a lax texture, and very eafily reduced to powder. It is found in feveral parts of England, efpecially in Derbyfhire; and is much ufed in marking fheep.

RUNCHES, charlock when dry and withered.

RUE, the ftem of a well-known plant, cultivated in moft kitchen-gardens.

It may be propagated either by fowing its feeds, or by planting flips or cuttings of it in the fpring.

RUNNEL, pollard wood.

RUNNET, the acid juice found in the ftomachs of calves, that have fed on nothing but milk, and are killed before the digeftion is perfect. It alfo fignifies a liquor made by fteeping of the ftomach of a calf in hot water. The latter is the runnet ufed in making cheefe, &c.

RUNNING-THRUSH, *or* FRUSH, is an impofthume that fometimes gathers in a horfe's frog; or a fcabby and ulcerous difpofition, which fometimes caufes it to fall off.

When this difcharge is natural the feet fhould be kept clean, but no drying wafhes made ufe of, it being thought as unfafe to repel fome of thefe difcharges, as to cure fome fweaty feet.

When an impofthume, or gathering appears, the fafeft way is to pare out the hard part of the frog, or whatever appears rotten; and wafh the bottom of the foot two or three times a day with old chamberlye; this is the fafeft and beft way of treating them. But when a horfe has been neglected, and there is a ftrong flux to the part, it is apt to degenerate into a canker, to prevent which, ufe the following:

> Take fpirit of wine and vinegar, of each two ounces, tincture of myrrh, and aloes one ounce; Ægyptiacum half an ounce; mix together.

Bathe the thrufh with this, wherever there appears a more than ordinary moifture, and lay over the ulcer a little tow dipped in the fame. The purges and diuretics recommended in the greafe, fhould be given at this time, to prevent the inconveniencies that the drying up thefe difcharges frequently occafion *See the article* CANKER. *Bartlet's Farriery, pag.* 312.

RUNT, a name given to the fmall black cattle brought out of Wales and Scotland.

RUNT, is alfo an epithet applied to feveral fpecies of pigeons; as the Leghorn, Spanifh, and Friefland runt, &c.

The Leghorn runt is a ftately large pigeon, feven inches or better in the legs, clofe-feathered and faft-flefhed, extremely broad-breafted, and very fhort in the back. He carrries his tail, when he walks, fomewhat turned up like a duck's; his neck is longer than any other pigeon's, and he carries it bending like a goofe or fwan. He is goofeheaded, and his eye lies hollow in his head, with a thin fkin round it, like that of the Dutch tumbler. His beak is very fhort for fo large a bird, and has a fmall wattle on it, and the upper chap falls a little over. It is a very valuable pigeon, but is tender, and requires care.

The Spanifh runt is the longeft-bodied of all the pigeons; it is fhort-legged and loofe-feathered, and does not walk fo upright as the Leghorn runt. Thefe are of a great variety of colours, but are apt to have accidents in fitting, from their fitting too heavy, and often breaking their eggs.

The Friefland runt is a large pigeon, and has all its feathers reverted, or looking as if placed the wrong way.

The Roman runt is a pigeon of the fame general make with the common kind, but fo large and heavy that it can hardly fly.

The Smyrna runt is middle-fized, and is feather-footed, and that to fuch a degree fometimes, as to look as if there were wings upon the foot; the feathers of thefe are fometimes four or five inches long, and often pull the eggs and young out of the nefts. The common runt is the common blue pigeon kept for the table, and known to every body. *Moore's Columbarian.*

RUPTURE, a preternatural eruption of the guts or caul.

In regard to ruptures, though they are generally divided into particular claffes, we fhall only obferve, that by violent efforts of the horfe, or other accidents, the guts or caul may be forced between the mufcles of the belly at the navel, and through the rings of the mufcles into the fcrotum or cod. The fwellings are generally about the fize of a man's fift, fometimes much larger, defcending to the very hock; they are frequently foft, and yield to the preffure of the hand, when they will return into the cavity of the belly with a rumbling noife; and in moft the vacuity may be felt, through which they paffed.

On their firft appearance, endeavours fhould be made to return them by the hand; but if the fwelling fhould be hard and painful, in order to relieve the ftricture, and relax the parts, through which the gut or caul has paffed, let a large quantity of blood be immediately taken away, and the part fomented twice or thrice a day, applying over it a poultice made with oatmeal, oil and vinegar, which fhould be continued till the fwelling grows foft and eafier, or the gut is returned. In the mean time it would be proper to throw up emollient oily glyfters twice a day, and to let the horfe's chief diet be boiled barley, fcalded malt, or bran.

Should the fwelling afterwards return, we apprehend the reftringent applications ufually recommended on thefe occafions, will avail little without a fufpenfory bandage; fo that an ingenious mechanic in that art is chiefly to be relied on, for any future affiftance; though it has been obferved, that with moderate feeding, and gentle exercife, fome horfes have continued to be very ufeful under this complaint. *Bartlet's Farriery, page* 334.

RUSH, the name of a well known plant, too common in wet lands.

Rufhes always intimate a good foil; and may be deftroyed by lime, even after it has been flaked, by fea-coal afhes, and by draining the land.

RUST, a diftemper incident to corn, and generally called mildew. *See the article* MILDEW.

RYE, a fpecies of corn, greatly cultivated in the northern parts of England.

Mr. Miller is of opinion that all the rye fown in England is of the fame fpecies, though diftinguifhed by farmers into two varieties of winter and fpring rye, as he has not been able, by the moft fedulous experience, to find any difference.

The winter rye, which has the largeft grain, is what the generality of farmers cultivate. It is ufually fown in autumn, or at the fame time as wheat; and in many of our northern countries, as well as in Wales, they are often mixed and fown together; though as Mr. Miller rightly obferves, this muft be very bad hufbandry, becaufe the rye will always ripen fooner than the wheat; fo that if the latter be fuffered to ftand till fully ripe, the grain of the former will fhed; nor can this be practifed where the people are not accuftomed to eat rye-bread: for though fome account it good when mixed, it is fo very clammy that few who have been ufed to wheaten bread will ever relifh it.

Rye is generally fown on poor, lime-ftone, dry, gravelly, or fandy foils, where wheat will not thrive, and in fuch places it does very well. The ground fhould be dry when it is fown: for if much rain falls, even after the fowing, before the rye is come up, it often rots in the earth. It indeed rifes in a much fhorter time than wheat.

When fown upon light land, it ripens much earlier than a cold ftiff ground, and by continuing to fow it in fuch a foil during two or three years, it will be forwarded fo much as to ripen a month earlier than that which has been long raifed upon ftrong cold ground. For this reafon, thofe who are obliged to fow rye toward fpring, generally provide themfelves with this early feed. A little fprinkling of dung or mud, though it be but half the quantity commonly ufed for other corn land, will, if laid upon the rye ground, greatly advance the crop. The ufual allowance is two bufhels of feed to a ftatute acre, or, if it be new broke up ground, or land fubject to worms, about a peck more; and the produce commonly is about twenty bufhels upon an acre.

In the fummer of the year 1699, which was uncommonly dry, Mr. Mortimer reckoned ninety grains apiece in feveral ears of rye.

The fmall rye may be fown in the fpring, about the fame time as oats, and ufually ripens as foon as the other fort: but if the feafon prove wet, it is apt to run much to ftraw, and the grain is generally lighter than the other. The chief ufe of this fort is to re-fow lands where the autumnal crop has failed.

This corn is ripe when its ftraw turns yellow, its ear hangs, and its grain is hard. It is not very apt to fhed; and therefore, if it be weedy (though this ought never to be the cafe with any corn), it fhould be let lie upon the ground, or gavel, as fome call it, a week or ten days after it is cut, if the weeds do not dry fooner, before it be bound up; for otherwife thofe weeds will give in the barn, make the rye not thrafh well, and render it mufty. But as this grain will grow in the ear fooner than any other, if it be wet, particular care muft be taken, efpecially if rain comes on, to turn it at leaft once in two or three days, and lay the ears upon the ftubble, as high above the ground as can be. This will help to preferve it from hurtful moifture: but if it be cut in perfectly dry weather, and without weeds, it may be houfed as it is reaped.

The general ufe of rye is for bread, either alone, or mixed with wheat, in which ftate it is called meflin corn. It alfo yields a ftrong fpirit when diftilled; and, if fowed only for dreffing of land, is of vaft fervice to the ground where it is plowed in green and fucculent. The truly worthy, and reverend Dr. Eliot informs us, that he has not only been told, but knows by his own obfervation, that if rye be fowed fucceffively every year upon the fame land, both the crop and the land will be greatly improved; infomuch that fome grounds which would yield but five bufhels to the acre at firft, have, in time, afforded a crop of fifteen bufhels to the acre, without the charge of dung, or any manure. But it fhould be remembered that the land fown by Dr. Eliot, was newly broke up.

This plant is likewife fown in autumn to great advantage, purpofely for green feed for cattle, particularly for ewes and lambs in the fpring, before there is plenty of grafs. When this is intended, the rye fhould be fown early, that it may have ftrength to furnifh early fodder. In this light, it fupplies the want of turnips where they have failed, or where their feafon is over: fo that, in fuch cafes, it is very good hufbandry to fow the land with rye, efpecially where there are ftocks of fheep, which cannot be well fupported without green food early in the fpring. The farmer who has many fheep fhould confider, that turnips are always a very precarious crop; and therefore he fhould, befide fowing fome places with cole-feed, in order to have green fodder, fow rye in others, to guard againft accidents. If fome of the ground fowed late with turnips, which have failed, be fown in the autumn with rye, he will find it turn to good account. To have green fodder for cattle in April, which is the fcarceft time of all the year, fome fplit the ridges of their wheat-ftubble, and fow them with rye, allowing about a bufhel to an acre, which they harrow in, and feed about April, or when they want it; and in May they plough it up for a fallow.

The ingenious Mr. Camber of Eaft Newton, in Yorkfhire, has given us the following obfervations on this grain, which is greatly cultivated in his neighbourhood.

" Rye, fays he, is very excellent for giving a good fkin to horfes, as it is loofening, and carries off foul humours, which hard exercife and bad provender may have left in them. It is alfo a moft excellent feed for geefe. I cannot fay the fame with refpect to hogs, for which animal it feems to me to be too loofening; infomuch that I have given a great deal of it to them when put up to feed, both dry and boiled, without perceiving any advance in their flefh.

" Rye is very generally liked for bread by the people of countries in which it grows commonly, and who are therefore much ufed to it; infomuch, that many of them fcruple not to prefer it to wheat, the bread of which prefently grows dry. There are, however, numbers of perfons, who, though ufed to it from their youth, can never relifh it. Some object to the fournefs of it when made with leven, and others to the natural fweetnefs of the grain, which is difagreeable, efpecially with the favourinefs of flefh meat; and, indeed, I am myfelf of this number.

" I agree entirely with Mr. Miller, that it muft be very bad hufbandry to fow wheat and rye together, as the latter will ripen much ealier than the former, and feveral obvious inconveniences enfue. They who like meflin, may mix them to their mind when carried to the mill, without any inconvenience.

" Many incidents may hinder the fowing of rye in autumn; the ground fhould, by all means, be dry when it is fown, and heavy rains after it is fown may rot it in the ground before it come up: fo that the fowing of fpring-rye becomes an object well deferving our attention: and all the directions and cautions which can be given about it fhould be nicely attended to.

" As drynefs is effential to the fuccefs of rye, it feems adviseable to delay the fowing of fpring-rye as long as can be, with any profpect of fuccefs, rather than not have both the ground dry for fowing, and the fucceeding weather for fome time after fowing likely to be fair; efpecially as rye foon rots in the ground, if wet.

" The ground defigned to be fown with rye in fpring, fhould be laid in winter with high ridges, and have good drains to carry off the water, that it may be as dry as poffible when fown.

" Hot manures fhould be ufed, and particularly lime, which will bring on a fpeedy fhooting. It was long a prevailing opinion, that lime was not a proper manure for the foil in which the lime-ftone was found; but experience has fhewn the vanity of this notion.

" Rolling may be more neceffary to fettle the earth about the roots of plants of rye fown in fpring than in autumn; for the winter frofts will have broke down the clods on to the roots of the autumn-fown rye, though indeed the rains may have partly wafhed that earth away.

" A moderare fowing of foot, after the plants are come up and rolled, may be of great advantage." *Mufeum Rufticum, vol.* IV. *pag.* 225.

The fame ingenious gentleman has obliged the world with the following obfervations on a courfe of crops; by which it appears that rye-land is nearly, if not quite, as valuable as wheat-land.

" The lands of Nether Dunsforth, in the weft riding of this county, are, in general, a ftrong clay, and bear good wheat. The lands at Helperby, a few miles diftant, are, in general, a good black loam, which bear good rye, but, on repeated trials, prove too light for wheat, as the moft fenfible farmers there affirm. Be this as it will, the lands let at the fame prices in both places, viz. at ten fhillings per acre; and we fhall fee that it may be as well afforded, according to the courfe of their crops, &c. which I learned only yefterday from two fenfible farmers, one of them living at the former place, on an eftate of my father's, and the other at the latter, and defirous to fucceed his companion as tenant to my father.

" At

"At Dunsforth they have a wheat-crop, a crop of blendings, as they are called; that is, beans and peas, then a fallow, and fo round again.

"At Helperby they have a crop of rye, then a crop of barley, then a crop of peas, then another crop of barley, and fo round again; and they obferve that the peas fo mellow the ground, that their fourth crop is better than their fecond.

"To bring thefe crops to a fair comparifon, we muft fay, that the Dunsforth men have five crops of wheat, and five of blendings, in fifteen years; and that the Helperby men have three crops of rye, three crops of peas, and fix crops of barley, in the fame fpace.

"To eftimate the real value of thefe crops, without too much nicety, we may fuppofe that the wheat is, one year with another, worth one fhilling and fix-pence per bufhel more than the rye; and that there are twenty-five bufhels of wheat and thirty of rye on an acre. We will take the medium price of wheat to be four fhillings and fix-pence, and of rye three fhillings.

	l.	s.	d.
An acre's crop of wheat then would be ——	5	12	6
Ditto of rye —— ——	4	10	0
Difference —— —— —	1	2	6
But as the ftraw of rye is known to be much more valuable, and of greater quantity, and the expence of manure and feed to be lefs, we may fafely deduct —— ——	0	10	0
So that the real difference of profit, on one acre, will be —— —— —	0	12	6
The crops of blendings and of peas may be reafonably confidered as on a par.			
The difference of profit then betwixt three crops of wheat and blendings on one fide, and three crops of rye and peas on the other, will be	1	17	6

We are now, gentlemen, to confider the difference betwixt the two remaining crops of wheat and two additional crops of blendings on one fide, and the fix crops of barley on the other.

	l.	s.	d.
Suppofing the charge of both fides to be the fame, (and there will be no confiderable difference) the two crops of wheat will be worth —	11	5	0
A crop of blendings ufually falls betwixt fifteen and twenty bufhels to the acre, and the medium price is three fhillings per bufhel: the value of a crop then, at an average, will be feventeen bufhels and an half, at three fhillings; that is, two pounds twelve fhillings and fix-pence, and of two crops of an acre ——	5	5	0
A crop of barley is ufually thirty-two bufhels to the acre at the place in queftion; and the medium price per quarter is one pound: the value therefore of the corn of an acre of barley is four pounds, or of fix crops ——	24	0	0
But the ftraw of barley is fo valuable, that it may be reckoned to exceed the expence of reaping by at leaft five fhillings; that is, for fix crops ——	1	10	0
I did not enquire whether the men of Helperby fow clover with their fourth crop; but they certainly may, and reap one good crop in the fallow year, and turn in all their ftock for a fortnight or three weeks to feed it down, and have time enough to plough in the roots of the clover, and the manure made by the cattle which eat it, and get their fallow into order; fo that we cannot reckon lefs profit hence than one pound per acre; that is, for three crops	3	0	0
Nay, when one confiders, that rye is, of choice, fown late in this country, we may allow a fecond crop of clover and feeding, which cannot be worth lefs than fifteen fhillings per acre; that is, for three crops —— —	2	5	0

The whole account then will ftand as follows.

For the wheat-growers.

	l.	s.	d.
By balance of three crops of wheat againft ditto of rye, and two of blendings againft ditto of peas —— —— —	1	17	6
Brought over	1	17	6
By two crops of wheat —— ——	11	5	0
By ditto of blendings —— ——	5	5	0
Total ——	18	7	6
For the rye-growers:			
By the corn of fix crops of barley ——	24	0	0
By the ftraw —— —	1	10	0
By clover —— —— —	5	5	0
Total ——	30	15	0
Balance of the fifteen years, in favour of the latter	12	7	6

"That is, for one year on one acre, fixteen fhillings and fix-pence; that is a profit more than the rent of the ground, and half as much again above the profit of the wheat-grower.

"Some inexperienced people may think that I have thrown more advantage into the fcale of the rye-growers than I ought: yet, on the ftricteft review, I cannot think fo; but that, on the contrary, I have reckoned their advantages too low. I am fure I am not partial, for I own a wheat-crop my favourite one, (I having a natural diflike to rye-bread) though I own the rye-ground more advantageous to the farmer. Let us review my account.

"Am I thought to deduct too much, when I take off ten fhillings for the faving in feed, and gaining in ftraw, of rye? furely I ought not; for, as wheat is confiderably larger than rye, fewer grains fill the bufhel, confequently more fhould be allowed to an equal portion of land: and farmers who fow nine pecks of rye, fow twelve of wheat to the acre. Now the price of the former (according to the reafonable ftate above) is fix fhillings and nine-pence; of the latter, thirteen fhillings and fix-pence; confequently the faving, feven fhillings and three-pence. And whoever confiders the greater length and finenefs of rye-ftraw than that of wheat, muft think two fhillings and nine-pence per acre a very fmall allowance for it.

"Is it thought that more labour in ploughing attends the production of twelve crops than ten? Be it confidered, rye-land is lighter, and therefore much eafier ploughed, than wheat land; and that in the courfe of this wheat-hufbandry, the fallow is to be ftirred nearly as often as it would be to prepare it for the additional crops; and that, the oftener any ground is ftirred, the more eafily it is ftirred; and that the crops of peas and clover mellow the ground, and make it more eafily ftirred for the fowing down with hard corn; alfo, that it lies unftirred every fourth year, from the fowing down of barley to the eating off the clover, about fifteen months. From all which confiderations it feems moft evident, that the fame team and ploughman will, with more eafe, work the fame quantity of rye-land, to produce its twelve crops of corn, and the clover too, than they could wheat-land to produce the ten corn-crops.

"Am I imagined to reckon the expences of feed and manure for two crops of wheat and two of blendings too high, when I put them on a par with thofe of fix crops of barley? As this feems the moft exceptionable, I will ftate the matter fomewhat more particularly.

"The feed for wheat is three bufhels to an acre, which, at four fhillings and fix-pence, come to thirteen fhillings and fix-pence; for two crops, to one pound feven fhillings. The feed for blendings is four bufhels to an acre, which, at three fhillings the bufhel, come to twelve fhillings per acre; for the two crops, to one pound four fhillings. The feed for the four crops cofts then two pounds eleven fhillings.

"Four bufhels of barley fow an acre, and, at two fhillings and fix-pence per bufhel, come to ten fhillings per acre, or, for the fix crops, to three pounds. The difference then in the value of the feed in the two methods, is only nine fhillings. Now, let it be confidered, that the ground is prepared, as to manure, by the rye-crop for the former barley-crop, and by the crop of peas for the latter barley-crop; fo that nothing need be charged on this account: whereas, to prepare the ground for the two crops of wheat, the farmer muft be at great expence in manure, either in burning, or (which is generally much worfe) buying

buying of lime, and leading it, or at least in leading his own or bought dung; so that the nine shillings saved in the seed will go a very little way in this great expence. Besides, the clover so opens and mellows the ground, and the dung occasioned by eating of it, either at home or in the field, so enriches the soil, that much, if not all, the expence of manure for a crop of rye is saved; and this allows the farmer to lay his manure, otherwise needless, on to his barley-ground, and improves it for that crop, and the succeeding crops of clover and rye too; and on this account great deductions should be made from the expence of the three rye-crops compared with the three of wheat at the head of this account; so that I am clearly of opinion, that, instead of there being any balance therein in favour of the wheat-growers, it would fall considerably on the side of the rye-growers.

"In the last place, am I supposed to take the quantity of wheat on an acre too low? I answer, I take it from the course of the country where the comparison is made; and if greater crops are reaped elsewhere of wheat, so are there also of rye.

"I was lately assured, by a farmer on the estate adjoining to this, that he has frequently reaped fifty-five bushels of rye off an acre, and his father has reaped as much or more off the land in this estate. I am fully persuaded it will be found, on enquiry, that one sixth in quantity, as I state it, is too little in favour of rye. A stook of good rye usually yields five pecks, or more, while a good stook of wheat, whose stalks are thicker, and bed less close, and make much less bands, seldom yields so much as a bushel; so that, if there be an equal number of stooks, as large as can be made, of each sort, on an acre, there will be one fifth, or six bushels in thirty more of rye than wheat, cæt. par. as philosophers speak." *Museum Rusticum, vol. IV. pag.* 345.

RYE-GRASS. *See the article* RAY-GRASS.

S.

SAFFRON, a genus of plants with narrow grass-like leaves, which have a white line running along the middle: the stalk is short and undivided, and bears on the top a purplish blue flower, deeply cut into segments: in the middle of the flower arises, among the stamina, a whitish pistil, divided at the top into three chives or fleshy filaments, the lower part of which is slender and pale coloured, the upper broader, of a deep orange red, and very finely indented about the sides: these filaments, carefully picked, and pressed together into cakes, are the saffron of the shops. The plant is perennial, and flowers in autumn.

As saffron grows at present most plentifully in Cambridgeshire, and has grown formerly in several other counties of England, the method of culture does not, I believe, vary much in any of them; and therefore I judge it sufficient to set down here the observations which I employed proper persons, in different seasons to make, in the years 1723, 1724, 1725, and 1728, up and down all that large tract of ground that lies between Saffron-Walden and Cambridge, in a circle of about ten miles diameter.

In that county saffron has been cultivated; and therefore it may reasonably be expected, that the inhabitants thereof are more thoroughly acquainted with it than they are any where else.

I shall begin with the choice and preparation of the ground: the greatest part of the tract already mentioned is an open level country, with few inclosures; and the custom there is, as in most other places, to crop two years, and let the land be fallow the third. Saffron is always planted upon fallow ground, and, all other things being alike, they prefer that which has borne barley the year before.

The saffron grounds are seldom above three acres, or less than one; and, in choosing, the principal thing they have regard to is, that they be well exposed, the soil not poor, nor a very stiff clay, but temperate dry mould, such as commonly lies upon chalk, and is of an hazel-colour; though, if every thing else answers, the colour of the mould is pretty much neglected.

The ground being made choice of about Lady-day, or the beginning of April, it must be carefully plowed, the furrows being drawn much closer together, and deeper, if the soil will allow it, than it is done for any kind of corn; and, accordingly, the charge is better.

About five weeks after, during any time in the month of May, they lay between twenty and thirty loads of dung upon each acre; and, having spread it with great care, they plow it in as before; the shortest rotten dung is the best; and the farmers, who have the conveniency of making it, spare no pains to make it good, being sure of a proportionable price for it. About Midsummer they plow a third time, and, between every sixteen feet and a half or pole in breadth, they leave a broad furrow or trench, which serves both as a boundary to the several parcels, when there are several proprietors to one inclosure, and to throw the weeds in at the proper season.

To this head likewise belongs the fencing of the grounds, because most commonly, though not always, that is done before

before they plant. The fences confift of what they call dead hedges, or hurdles, to keep out not only cattle of all forts, but efpecially hares, which would otherwife feed on the faffron leaves during the winter.

About the weather we need only obferve, that the hotteft fummers are certainly the beft: and therewith, if there be gentle fhowers from time to time, they can hardly mifs of a plentiful crop, if the extreme cold, fnow, or rain of the foregoing winter have not prejudiced the heads.

The next general part of the culture of faffron, is planting or fetting the roots: the only inftrument ufed for which is a narrow fpade, commonly termed a fpit-fhovel.

The time of planting is commonly in July, a little fooner or later, according as the weather anfwers. The method is this: one man with his fpit-fhovel arifes between three and four inches of earth, and throws it before him about fix or more inches; two perfons, generally women, following with heads, place them in the fartheft edge of the trench he makes, at three inches diftance from each other, or thereabouts: as foon as the digger or fpitter has gone once the breadth of the ridge, he begins again at the other fide, and digging, as before, covers the roots laft fet, and makes the fame room for the fetters to place a new row, at the fame diftance from the firft as they are from one another: thus they go on, till a whole ridge, containing commonly one rod, is planted; and the only nicety in digging is, to leave fome part of the firft ftratum of earth untouched, to lie under the roots; and, in fetting, to place the roots directly upon their bottom.

What fort of roots are to be preferred, fhall be fhewn under the fourth head; but it muft be obferved in this place, that formerly, when roots were very dear, they did not plant them fo thick as they do now; and that they have always fome regard to the fize of the roots, placing the largeft at a greater diftance than the fmaller ones.

The quantity of roots, planted in an acre, is generally about fixteen quarters, or one hundred and twenty-eight bufhels, which, according to the diftances left between them, as before affigned, and fuppofing all to be an inch in diameter one with another, ought to amount to three hundred and ninety two thoufand and forty in number.

From the time that the roots are planted, till about the beginning of September, or fometimes later, there is no more labour about them; but as they then begin to fpire, and are ready to fhew themfelves above ground, which is known by digging a few out of the earth, the ground muft be carefully pared with a fharp hoe, and the weeds, &c. raked into the furrows, otherwife they would hinder the growth of the plants.

In fome time after appear the faffron flowers; and this leads us to the third branch of our prefent method. The flowers are gathered as well before as after they are full blown; and the moft proper time for this is early in the morning. The owners of the faffron get together a fufficient number of hands, who place themfelves in different parts of the field, pull off the whole flowers, and throw handful by handful into a bafket, and fo continue till all the flowers are gathered, which happens commonly about ten or eleven o'clock. Having then carried home all they have got, they immediately fpread them upon a large table, and fall to picking out the filamenta ftyli, or chives, and together with them a pretty long proportion of the ftylus itfelf, or ftring to which they are joined; the reft of the flower they throw away as ufelefs. The next morning they return into the field again, whether it be wet or dry, weather; and fo on daily, even on Sundays, till the whole crop be gathered.

The chives being all picked out of the flowers, the next labour about them is to dry them on the kiln. The kiln is built upon a thick plank, that it may be removed from place to place, fupported by four fhort legs: the outfide of eight pieces of wood about three inches thick, in form of a quadrangular frame, about twelve inches fquare at the bottom on the infide, and twenty-two inches at top; which is likewife equal to the perpendicular height of it. On the forefide is left a hole about eight inches fquare, and four inches above the plank, through which the fire is put in. Over all the reft laths are laid pretty thick, clofe to one another, and nailed to the frame already mentioned; and then are plaiftered over on both fides, as are alfo the planks at bottom very thick, to ferve for an hearth. Over the mouth or wideft part goes an hair-cloth, fixed to the fides of the kiln; and likewife to two rollers, or moveable pieces of wood, which are turned by wedges or fcrews, in order to ftretch the cloth. Inftead of the hair-cloth, many people now ufe a net-work, or iron wire, with which it is obferved that the faffron dries fooner, and with a lefs quantity of fuel: but the difficulty in preferving the faffron from burning, makes the hair-cloth be preferred by the niceft judges in drying.

The kiln is placed in a light part of the houfe; and they begin by laying five or fix fheets of white paper on the hair-cloth, upon which they fpread the wet faffron, between two and three inches thick; this they cover with other fheets of paper, and over thefe lay a coarfe blanket five or fix times doubled; or, inftead thereof, a canvas pillow filled with ftraw; and, after the fire has been lighted for fome time, the whole is covered with a board, having a large weight upon it.

At firft they give it a pretty ftrong heat, to make the chives fweat, as their expreffion is; and in this, if they do not ufe a great deal of care, they are in danger of fcorching, and fo of fpoiling all that is on the kiln.

When it has been thus dried about an hour, they take off the board, blanket, and upper papers, and take the faffron off from that which lies next it; raifing, at the fame time, the edges of the cake with a knife; then, laying on the paper again, they flide in another board between the hair-cloth and under papers, and turn both papers and faffron upfide down; afterwards covering them, as above.

This fame heat is continued for an hour longer; then they look on the cake again, free it from the papers, and turn it: then they cover it, and lay on the weight, as before. If nothing happens amifs during thefe firft two hours, they reckon the danger to be over: for they have nothing more to do, but to keep a gentle fire, and to turn their cakes every half-hour, till thoroughly dry: for the doing of which as it ought, there are required full twenty-four hours.

In drying the layer plump chives they ufe nothing more, but towards the latter end of the crop, when thefe come to be fmaller, they fprinkle the cake with a little fmall beer, to make it fweat as it ought; and they begin now to think, that ufing two linen cloths next the cake, inftead of two innermoft papers, may be of fome advantage in drying: but this practice is followed as yet but by few.

Their fire may be made of any kind of fuel; but that which fmokes the leaft is beft; and charcoal, for that reafon, is preferred to any other.

What quantity of faffron a firft crop will produce, is very uncertain; fometimes five or fix pounds of wet chives are got from one root; fometimes not above one or two; and fometimes not enough to make it worth while to gather and dry it. But this is always to be obferved, that about five pounds of wet faffron go to make one pound of dry, for the firft three weeks of the crop; and fix pounds during the laft week; and, now the heads are planted very thick, two pounds of dried faffron may, at a medium, be allowed to an acre for the firft crop, and twenty-four pounds for the two remaining; the third being confiderably larger than the fecond.

In order to obtain thefe, there is only a repetition to be made every year of the labour of hoeing, gathering, picking, and drying, in the fame manner as before fet down, without the addition of any thing new; except that they let cattle into the field, after the leaves are decayed, to feed upon the weeds; or, perhaps, mow them for the fame ufe.

About the Midfummer after the third crop is gathered, the roots muft be all taken up and tranfplanted: the management requifite for which is the fourth thing to be treated of. To take up the faffron heads, or break up the ground, as the term is, they fometimes plow it, fometimes ufe a forked kind of hoe, called a pattock, and then the ground is harrowed once or twice over; during all which time of plowing or digging, and harrowing, fifteen or more people will find work enough to follow and gather the heads, as they are turned up.

They

They are next to be carried to the houfe in facks, and there cleaned and raifed: this labour confifts in cleaning the roots thoroughly from earth, and from the remains of old roots, old involucra, and excrefcences; and thus they become fit to be planted in new ground immediately, or to be kept for fome time, without danger of fpoiling.

The quantity of roots taken up, in proportion to thofe which were planted, is uncertain; but, at a medium, it may be faid, that, allowing for all the accidents which happen to them in the ground, and in breaking up from each acre, may be had twenty-four quarters of clean roots, all fit to be planted.

The owners are fure to chufe for their own ufe the largeft, plumpeft, and fatteft roots; but do leaft of all approve the longeft-pointed ones, which they call fpickets, or fpickards; for very fmall round or flat roots are fometimes obferved to flower. This is the whole culture of faffron in the county abovementioned; and we have only now to confider the charges and profits which may be fuppofed, one year with another, to attend that branch of agriculture; and of thefe I have drawn up the following computation for one acre of ground, according to the price of labour in this county.

	l.	s.	d.
Rent for three years	3	00	0
Plowing for three years	0	18	0
Dunging	3	12	0
Hedging	1	16	0
Spitting and fetting the heads	1	12	0
Weeding or pairing the ground	1	04	0
Gathering and picking the flowers	6	10	0
Drying the flowers	1	06	0
Inftruments of labour for three years, with the kiln, about	0	10	0
Plowing the ground once, and harrowing twice	0	12	0
Gathering the faffron heads	1	00	0
Raifing the heads	1	12	0
Total charge	23	12	0

This calculation is made upon fuppofition, than an acre of ground yields twenty-fix pounds of net faffron in three years; which I ftated only as a mean quantity between the greateft and the leaft; and therefore the price of faffron muft be judged accordingly; which I think cannot be done better than by fixing it at thirty fhillings per pound; fince, in plentiful years, it is fold at twenty, and is fometimes worth three or four pounds: at this rate, twenty-fix pounds of faffron are worth thirty-nine pounds; and the net profits of an acre of ground, producing faffron, will, in three years, amount to fifteen pounds thirteen fhillings, or about five pounds four fhillings yearly.

This, I fay, may be reckoned the net profit of an acre of faffron, fuppofing that all the labour were to be hired for ready money: but, as the planter and family do a confiderable part of the work themfelves, fome of this expence is faved: that is, by planting faffron, he may not only reafonably expect clear about five pounds yearly per acre, but alfo to maintain himfelf and family for fome part of each year: and it is upon this fuppofition only, that the refult of other computations can be faid to have any tolerable degree of exactnefs; but the calculations themfelves are undoubtedly very inaccurate.

I have faid nothing here concerning the charge in buying, or profits in felling the faffron heads; becaufe, in many large tracts of ground, thefe muft at length balance one another, while the quantity of ground planted yearly continues the fame; which has been pretty much the cafe for feveral years paft. *Philofophical Tranfactions, Numb.* 405.

SAGE, the name of a well known plant, much cultivated in kitchen-gardens.

Sage is moft commonly propagated by flips; not only becaufe its feeds cannot always be obtained perfect in this country; but alfo, becaufe that is by much the eafieft and moft expeditious way. Thefe flips fhould be planted about the beginning of April, in a fhady border, where they will foon take root, if they are watered now and then in cafe the feafon be dry. When they are grown ftrong enough to be removed, they fhould be taken up with a ball of earth about their roots, and tranfplanted into the places where they are to remain. This fhould be in a dry foil, where they may enjoy the benefit of the fun: for if they are left to remain in moift ground, or in a fhady fituation, they will not well bear the inclemency of the winter: neither will they be fo hardy, or fo highly flavoured, if they are fet in a rich foil, as when they grow on a barren, dry, and rocky fpot. Keeping them clear from weeds is the principal part of their culture. The roots of all the common garden forts of fage will laft feveral years: but their tops fhould not be cropped too often for ufe, left the plants fhould become ragged, and there fhould not be a due fucceffion of young fhoots. The fureft way to obtain this, is to fet a parcel of new flips every other year. The fide fhoots, and tops of the balfamic or tea fage, which is generally dried and kept for ufe, fhould be gathered in a very dry day, in the fummer; but thofe of the other forts are beft when taken green from the plants.

The fpecies of fage moft ufually cultivated in the kitchen-garden, are, the large broad leaved fort, of which the common green, the wormwood, the variegated green, the red, and the variegated red, are only accidental variations; the tea fage abovementioned, which alfo has broad leaves, but more jagged at their edges; and the fmall, or rather narrow, hoary leaved fage, commonly called fage of virtue. All the other forts of this plant are cultivated for variety, more than for ufe.

Sage in general flowers about the latter end of June, and beginning of July; and whenever its feeds ripen in this country, which is but feldom, it is in autumn.

SAINTFOIN, *or* SAINFOIN, the name given by the French, and continued by us to a fpecies of plant, frequently ufed for the food of cattle, either frefh or dried; it is called holy-hay, or wholefome hay, from its excellent nutritive quality. The ftalks of the plant are commonly about two feet long, but they grow fometimes to five or fix feet, and it has tufts of red flowers of three, four, or five inches in length.

This plant will make a forty times greater increafe in poor ground than the common turf; and this is owing to its having a long perpendicular root, of that kind, called tap roots, which finks to a great depth to attract its nourifhment. The length of this root is fcarce to be credited by any but thofe who have feen it; it is frequently drawn out of the ground to the length of twelve or fourteen feet, but it is faid to be often thirty feet or more in length.

The farmers have a general opinion, that this plant never fucceeds well in any land, where there is not an under ftratum of ftone, or chalk, or fome other hard matter, to ftop its running; but that otherwife it fpends itfelf in root, and comes to nothing above ground. This is an error too grofs to need much refutation. It is certain, that the roots being to plants what the ftomach and guts are to animals, the more and larger roots any plant has, the more nourifhment it receives, and the better it thrives.

Saintfoin always fucceeds where its roots run deep, and the beft crops of all are produced upon lands where there is no hard under foil to obftruct their paffage. An under foil of clay may kill the plants, by retaining the water, and chilling and rotting their roots.

The long root of faintfoin has, near the furface, many horizontal roots iffuing from it, which extend themfelves every way; there are of the fame kind all the way down, as the roots go, but they grow fhorter and fhorter all the way. Any dry land may be made to produce this valuable and ufeful plant, though it be ever fo poor, but the richeft and beft land will produce the beft crops of it. The beft way of fowing it is by drilling, but the earth muft be very well prepared, and the feed well ordered, or elfe very little of it will grow. The heads of thefe feeds are fo large, and their necks fo weak, that, if they be much more than half an inch deep, they are not able to rife through the incumbent mould; and, if they are not covered, they will be malted, as the farmers exprefs it; that is, it will fend out its root while it lies above-ground, and be killed by the air; and whether the farmer plants bad feed that will not grow, or good feed that is buried or malted, the event will be the fame. The ground will be under-

underftocked with plants. A bufhel of feed to an acre of land is full twenty feeds to each fquare foot of land; but, as there is fome difference in the largenefs of the feeds, there is no abfolute certainty as to this calculation. The worft feafons for planting it are the beginning of winter, and the drought of fummer; the beft is the beginning of the fpring; and it is always ftrongeft when planted alone, and is not fown together with corn, as is the practice of fome farmers. If barley, oats, or any other corn, fown with the faintfoin, happen to be lodged afterwards, it kills the young faintfoin. If it be planted with any other corn, it is beft done by drilling in the horfe-hoeing way; in this cafe it is not much liable to be killed by the lodging of the corn, as the drilled corn feldom falls at all, and, when it does, never falls fo low as the fown corn.

The quantity of feed to be drilled upon an acre of land will depend wholly upon the goodnefs of it; for there is fome feed of which not one in ten will ftrike, whereas in good feed not one in twenty will fail. The method of knowing the goodnefs, is, by fowing a certain number of the feeds, and feeing how many plants are produced by them. The external figns of the feeds being good are, that the hufk is of a bright colour, and the kernel plump, of a light grey or blue colour, and fometimes of a fhining black. The feed may be good, though the hufk be black, as that is owing fometimes to the letting it receive the wet in the field, not to its being half rotted in the heap.

If the kernel be cut a-crofs, and appear greenifh and frefh, it is a certain fign that it is good. If it be of a yellowifh colour, and friable, and look thin and pitted, they are bad figns. The quantity of feeds allowed to the acre in the drill way is much lefs than that by fowing, and is to be computed according to the number of plants that are to be allowed in that fpace, allowing for the common cafualties. It is not neceffary to be exact in this calculation, or to fay whether two, three, or four hundred plants are to be allowed to a fquare perch; neither is it poffible to know beforehand the precife number of plants that may live out of thofe that come up; for fometimes the grub takes them when they have only the two firft leaves, and the crop is greatly diminifhed by this means. Four gallons of good feed to an acre of land will cover it with plants, when judicioufly managed.

Single plants of faintfoin make the greateft crops; but the farmers, in general, plant them fo clofe, that they ftarve one another. The fingle plants always run the deepeft, and thofe which do fo will always draw moft nourifhment. The plants which ftand crowded ftarve one another, and often die after a few years; but the fingle ones grow to a vaft bignefs, and are every year better and better.

The beft way to calculate how many plants are to be allowed to a perch, is to compute how much hay each fingle large plant will produce; for, if kept fingle, and well cultivated, they will all be large ones. Without culture, thefe plants never arrive at a fourth part of the fize that they do with it. The hay of a large fingle cultivated plant will weigh more than half a pound, a hundred and twelve plants upon a fquare perch, weighing but a quarter of a pound a piece, one with another, amount to two tons to an acre. If faintfoin be planted on fome forts of land early in the fpring and hoed, it will fometimes produce a crop the following fummer; in a garden the feeds fown in February will yield plants of two feet high that will flower in the month of June following; and, though March be frofty, the young plants feldom fuffer by it. This fhews, that this plant is naturally a quick grower; but the farmers ufually plant it on poor or cold land, and give it too little culture, which make it backward, and flow of growth with them. The poor land, ufually allotted to this plant, alfo makes it generally yield but one crop a year, but on a rich land it will yield two very good crops annually, with a moderate fhare of culture and management.

The farmer who expects to make a profit of this plant muft not expect a good crop the firft year. Nothing is fo injurious to faintfoin as its ftanding too thick; if it be fown fo thick as to cover the ground the firft fummer, the plants will ftarve one another for ever after; but, if the owner will be content to place them fo thinly as to have but a fmall crop the firft year, they will increafe prodigioufly, and every fucceeding crop will be better and better. When faintfoin is well hoed, it will grow as much in a fortnight as it would otherwife do in fix weeks; and this quick growing is of advantage to it every way, not only making the plants large, but of better nourifhment to the cattle, whether they are eaten green or made into hay.

The proper diftance to drill this plant for the horfe-hoeing hufbandry is at double rows with eight inch partitions between them, and thirty inch intervals between every two and two. Thefe intervals need only be hoed alternately, leaving every other interval for making the hay on. This method of hoeing is of vaft advantage, and poor land by means of it will always produce two crops a year. The land is always to be perfectly cleared of grafs before the fowing the faintfoin, and the lumps of earth carefully broken. But no harrowing is to be allowed after it is drilled, for that would bury it; and; and it is not proper to roll it at all, unlefs for the fake of barley, when they are fown together; and when that is done, it fhould be with a light roller, and in dry weather. This fhould be done lengthwife of the rows, and as foon as it is drilled; if it be not done at this time, it is beft to ftay three weeks before it is done, that the necks of the young faintfoin may not be broken.

No cattle are to be fuffered to come in the firft winter upon the faintfoin, after the corn is out, among which it was fown. Their feet would injure it by treading the ground hard, as much as their mouths by cropping it, and it would never come to good. Sheep fhould not be fuffered to come at it, even the following fummer and winter. One acre of drilled faintfoin, confidering the difference of the quantity and goodnefs of the crop, is worth two acres of fown faintfoin on the fame land, though the expence of drilling be twenty times lefs than that of fowing. The firft winter is the time to lay on manure after the corn is reaped off. Pot-afhes, or the like, are very proper, and a fmall quantity of them will do, as there are at this time no other plants to partake of the benefit, but the young crop has it all; and the young plants, being thus made ftrong at firft, will continue fo, and be long the better for it.

It is obferved, however, that in the drilling and horfe-hoeing-way there is no neceffity for any manure at all. Some farmers fow eight or ten bufhels of the feed of faintfoin to an acre along with their corn, with intent that it fhould kill all the other weeds; but the confequence is, that the plants ftand clofe, and ftarve one another, and are no bigger than where the plant grows wild on the hills in Calabria, where it is fo fmall and feemingly defpicable a plant, that it feems a wonder that any body fhould be tempted to think of cultivating it: yet, when rightly managed, it feems capable of being as ufeful a plant as any in the world. Where thefe plants ftand fo thick, they draw out all the nourifhment from the ground, in a few years, and fo die, though manured ever fo carefully. Six or feven years feems their greateft duration; whereas, when the feed is drilled in, and the plants are horfe-hoed, they will be as ftrong and vigorous as ever, at thirty years ftanding.

Some people who have turned their thoughts to hufbandry, have been of opinion, that the cytifus would fucceed better with us than the faintfoin; it is probable enough that it would grow well; but the labour of fheering it would, with us, where the pay of fervants is fo dear, run away with the greateft part of the profits of the crop.

Lucerne is another thing which many have thought of introducing among us in the place of faintfoin, but it requires fo much care to fuit it with a proper foil, that, whatever are the profits of it, it never can be fo general as faintfoin. *Tull's Horfe-hoeing Hufbandry.*

Saintfoin, fays Mr. Duhamel, deferves the farmer's utmoft attention, as one of the moft profitable plants he can cultivate. It will do on almoft any land; and though it fucceeds beft in good foils, yet it will grow even on dry barren fpots, where fcarce any other grafs can live; provided its roots be not chilled by a cold clay, or other fubftance which retains water: and it has this farther advantage, that it may be mowed at different degrees of ripenefs, with nearly the fame profit.

1. It may be mowed before it is in bloom, for it is then admirable food for horned cattle; and when cut thus early,

early, it yields a ſecond crop, which makes ample amends for what was loſt by not letting the firſt come to its full growth. This early cutting is likewiſe attended with another benefit, which is, that it purges cattle, in the beginning of the ſummer, and thereby frees them from diſorders occaſioned by the winter's cold, or dry food.

2. If the weather be rainy, the ſaintfoin may be left ſtanding till it is in bloom; when it ſtill is excellent fodder for cows. But care muſt be taken in making it into hay, that the flowers do not drop off, as they are very apt to do: for cattle are ſo fond of theſe flowers, that they often induce them to eat the reſt of the plant.

3. If the rain continues, the ſaintfoin may be left ſtanding till ſome of its ſeeds are formed, and the crop will then be the more plentiful; not only becauſe it will have attained its full growth, but likewiſe becauſe its leaves, being more ſubſtantial, diminiſh leſs in drying. It is not indeed, then, quite ſo ſweet as before; but horſes eat it readily, becauſe they love to feel between their teeth the ſeeds, which now begin to be formed.

Mr. Tull ſays this fodder is ſo excellent, that horſes need no oats when they are fed with it. He affirms that he kept a team of horſes with it a whole year in good plight, without giving them any oats, though they were worked hard all the time. He adds, that he fattened ſheep with it, in leſs time than others which were fed with corn. But the hay of this plant can never be ſo good as when it is cultivated with the horſe-hoe: for in the common huſbandry, it bloſſoms almoſt as ſoon as it is out of the ground.

4. If the ſeaſon continues rainy, it may be more adviſeable to let the ſaintfoin remain ſtanding, than to run the hazard of having it rot upon the ground: for then the ſeed will ripen, and nearly make up for the loſs of the fodder; not only becauſe it will fetch a good price, but alſo becauſe two buſhels of it will go as far in feeding of horſes, as three buſhels of oats; and cattle in general, as well as poultry, are extremely fond of it.

The firſt of theſe ſorts of ſaintfoin hay, cut before the bloom, is Mr. Tull's virgin hay, which, he ſays, is the beſt beyond compariſon, and has not its equal, in the world, except lucerne. He gives the next place to the ſecond ſort, cut whilſt in bloom, and ſays that an acre of land, well cultivated, may yield three tons of this bloſſomed hay: and he eſteems the third ſort, which he calls the full grown, many degrees inferior to either of the former; though it yields a greater crop, becauſe it has grown to its full bulk, and ſhrinks but little in drying.

Even the ſaintfoil that has yielded its ſeed, may be cut down and dried; and when other fodder is ſcarce, this will be better food for horſes and large cattle, than the coarſe hay of flowed meadows, or any kind of ſtraw.

The manner of making ſaintfoin hay is thus directed by Mr. Duhamel.

In a day or two after the ſaintfoin has been mowed, it will be dry on the upper ſide, if the weather be good. The ſwarths, or mowed rows, ſhould then be turned, not ſingly, but two and two together: for by thus turning them in pairs, double the ſpace of ground is left betwixt pair and pair, and this needs but once raking, whereas, if the ſwarths were turned ſingly, that is, all the ſame way, the ground would require as much raking again.

As ſoon as both ſides of the ſwarths are a little dry, they ſhould be made up into ſmall cocks, the ſame day they are turned, if poſſible: for when the ſaintfoin is in cock, a leſs part of it will be expoſed to the injuries of the night, than when it lies ſcattered upon the field. The ſun and dew would exhauſt almoſt all its juices, in this laſt caſe, in leſs than a week's time.

Theſe little cocks of ſaintfoin may be ſafely made into larger ones, without waiting for their being ſo thoroughly dry as thoſe of common hay ought to be before they are laid together: becauſe common hay, by ſinking down cloſer, excludes the air neceſſary for keeping it ſweet; ſo that if the weather prevents its being frequently ſtirred and opened, it will heat, turn yellow, and be ſpoiled; whereas ſaintfoin, by admitting the air more freely, becauſe its ſtalks are leſs flexible, will remain much longer without any danger of fermenting.

Saintfoin hay is never better than when it has been dried by the wind only, without the aſſiſtance of the ſun. A little rain, or a miſt, which will turn common hay, clover, and even lucerne, black; will do no hurt to ſaintfoin, which is not really ſpoiled, till it rots upon the field.

If the weather threatens rain, and the ſaintfoin is not yet dry, it may be laid in cocks, without fear of its heating, provided a large baſket, or buſhy faggot, be ſet up in the middle of each cock, where it will ſerve for a vent-hole, through which the ſuperfluous moiſture of the hay will tranſpire.

As ſoon as all danger of its heating is over, theſe cocks ſhould be made into ricks, and thatched. That which is laid up quite dry, will come out of the rick of a green colour: that which has heated much in the rick, will look brown.

It requires ſome experience to know at what degree of ripeneſs it is beſt to cut the ſeeded ſaintfoin; becauſe all its ſeeds do not ripen at the ſame time. Some ears bloſſom before others; every ear begins bloſſoming at its lower part, and continues to blow gradually upward, for many days; ſo that before the flower is gone off at the top, the ſeeds are almoſt filled at the bottom. By this means, if the cutting be deferred till the top ſeeds are quite ripe, the lower, which are the beſt, would ſhed, and be loſt. The beſt time, therefore, to cut it, is when the greateſt part of the ſeed is well filled, the firſt blown ripe, and the laſt blown beginning to be full. The unripe ſeeds will ripen after cutting, and be, in all reſpects, as good as thoſe that were ripe before. Some, for want of obſerving this, have ſuffered their ſaintfoin ſeed to ſtand till all of it has ſhed, and been loſt in cutting.

Saintfoin ſhould never be cut in the heat of the day, while the ſun ſhines out; for then much, even of the unripe ſeed, will ſhed in mowing. The right time for this work, is the morning or the evening, when the dew has rendered the plants ſupple.

If the weather is fine and clear, the ſaintfoin will ſoon dry ſufficiently in the ſwarths, without turning them: but if any rain has fallen, and there is a neceſſity for turning them, it ſhould be done very gently, while they are moiſt, and not two ſwarths together, as in the other hay made of ſaintfoin before it has ſeeded. If the ſwarths are turned with the handle of the rake, it is beſt to raiſe up the earſides firſt, and let the ſtub-ſide reſt on the ground in turning: but if it is done with the teeth of the rake, let the ſtub-ſide be lifted up, and the ears reſted on the earth.

If ſaintfoin be cocked at all, the ſooner it is done, the better; becauſe, if the ſwarths are dry, much of the ſeed will be loſt in ſeparating them; the ears being entangled together. When moiſt, the ſeed ſticks faſt in the ear; but when dry, it drops out with the leaſt touch or ſhaking.

There are two ways of threſhing it: the one in the field, the other in the barn. The firſt cannot be done but in very fine weather, and while the ſun ſhines in the middle of the day. The beſt manner of performing this, is to have a large ſheet pegged down to the ground, for two men to threſh on with their flails, while two others bring them freſh ſupplies in a ſmaller ſheet, and two more clear away the hay that has been threſhed. The ſeed is emptied out of the larger ſheet, and riddled through a large ſieve, to ſeparate it from the chaff and broken ſtalks; after which it is put into ſacks, and carried into the barn to be winnowed. Care ſhould be taken not to let the hay get wet, becauſe it would then be ſpoiled.

A very important, and at the ſame time very difficult article, is the keeping of the ſeed that has been threſhed in the field, without having ever been wetted. If it be winnowed immediately, and only a little of it laid amidſt a great heap, or put into a ſack, it will ferment to ſuch a degree, in a few days, that the greateſt part of it will loſe its vegetative quality. During that fermentation, it will be very hot, and ſmell ſour. Spreading it upon a barn floor, though but ſeven or eight inches thick, will anſwer no end, unleſs it be frequently and regularly turned both day and night, until the heating it over: but even this will not make its colour keep ſo bright as that which is well houſed, well dried, and threſhed in the winter. This laſt,

laſt, laid up unthreſhed, will keep without any danger of ſpoiling, becauſe it does not lie cloſe enough to heat. The beſt way to preſerve the ſeed threſhed in the field, is, to lay a layer of ſtraw upon a barn floor, and upon that a thin layer of ſeed, then another layer of ſtraw, and another layer of ſeed, and ſo on alternately. By this means the ſeed mixing with the ſtraw, will be kept cool, and come out in the ſpring with as green a colour as when it was put in.

The following method is followed in cultivating ſaintfoin in the Iſle of Thanet.

Though the lands in general here are very rich and fruitful, owing to the good tillage, and the quantity of manure they enjoy, yet at ſome diſtance from the ſea they have land which is very barren and thin by nature; nevertheleſs, even this indifferent land they farm to the greateſt advantage. In theſe ſoils the farmers ſow ſaintfoin or French graſs with great ſucceſs, having ſometimes two loads of hay on an acre.

This graſs thrives beſt in theſe parts, on a thin coat of earth with a chalky bottom; it puſhes its long tap-root deep into the chalk, and extracts thence a nouriſhment, which is out of the reach of almoſt any other plant.

The land muſt always be exceedingly well prepared, before they attempt to put the ſeed in the ground; it has frequent plowings, and every the leaſt appearance of a weed or root of graſs is diligently picked off: graſs in particular is a very great enemy to this plant; without the utmoſt care it ſoon choaks and deſtroys it. They ſow this ſeed in April, either at the beginning, middle, or latter end of the month, according to the ſeaſon: dry weather is beſt, provided it does not long continue: however, a little rain in theſe light ſoils does no great hurt. The quantity of ſeed they allow to an acre is five buſhels; of courſe it is ſown very thick. It does not lie any great length of time in the ground: when it is come up, they carefully hoe and weed it, to keep down the roguery and graſs: this puts the plants forward, and makes them ſo vigorous and ſtrong, that they will of themſelves keep down the graſs, eſpecially in theſe chalky bottoms, where graſs does not thrive well, and is not apt to coat land with turf.

Saintfoin uſed formerly to hold good in theſe parts for twenty years together, but it does not now of late years laſt ſo long: this is probably owing to their want of care in chuſing their ſeed, which ſurprizes me, conſidering what good farmers they in general are. They get, it is true, when they can, the beſt ſeed the iſland affords: but it would certainly be a much better way were they now and then to procure ſome of a finer growth from France: for it was from that country, as far as I can underſtand, it firſt came hither, about the latter end of Charles the Second's reign; and I do not hear from the inhabitants that they ever remember the importing any more ſince.

The climate of France is more natural to it; of courſe the ſeed comes to greater perfection there, whilſt, on the contrary, in England, that, as well as many other crops, is apt to degenerate after a certain number of years.

Where this crop takes, it is very advantageous to the farmer; it yields him for many years plenty of excellent fodder, and that upon land which would otherwiſe, perhaps, ſcarcely yield him any profit at all; and beſides all this, when the ſaintfoin begins to fail, if proper care is taken, the land when broke up will be found greatly refreſhed, and in a better condition to bear tillage and a ſucceſſion of other crops.

The farmers here, when they intend breaking up a ſaintfoin lay, feed it the laſt three or four years: mowing it at this time, they think, hurts and exhauſts the land too much; and beſides, the dung and urine of the cattle are of great ſervice.

They obſerve here, as well as in other places where ſaintfoin is cultivated, that after land has been once ſown with it, it will not for ſome years, to any advantage, bear ſaintfoin again. *Muſeum Ruſticum, vol.* I. *pag.* 109.

The reader is obliged to Mr. Holdway, an old experienced farmer at Marlborough in Wiltſhire, for the following account of cultivating ſaintfoin in that county.

"About one hundred years ago, ſays he, the culture of ſaintfoin was firſt introduced into Wiltſhire, and was ſoon preferred to clover graſs; and there was indeed ſome reaſon for this preference, for it thrives much better, and yields a much larger encreaſe, on poor hungry ſoils, than clover can do.

"Another very good reaſon may be aſſigned why ſaintfoin was ſo well received. The ſowing it at all was conſidered as a new huſbandry, and the timorous farmers were very unwilling to hazard the trial of any new method on lands which would any other way yield them any conſiderable advantage: it was chiefly in corners of fields, of very little uſe to the farmer, that this paſture was firſt tried, and that on poor land, as, ſhould it not have ſucceeded, the only loſs would have been the ſeed; yet many occupiers of land would not, at firſt, hazard even this trifling loſs.

"But the ſentiments of theſe farmers were ſoon altered in this matter: clover wears out in a few years, whereas many, who ſowed ſaintfoin on poor land not worth above ſix ſhillings an acre, found their land ſo much improved, as to be very ſpeedily worth thirty ſhillings the acre, and at the end of twenty years it continued yet in good proof.

"In fact, it will thrive, and be a very conſiderable improvement, on the pooreſt, and ſeemingly the barreneſt land; but it muſt be remembered, that ſheer and ſlight ſands, and all clays, and other cold and wet ſoils, are to be excepted: on rich land the weeds ſoon deſtroy it. Beſides, as it ſends its roots very deep in ſearch of nouriſhment, the longer it occupies the land, the more good it does it; whereas this is far from being the caſe with ſhallow-rooting plants.

"A ſaintfoin lay may at any time be broke up, when it will be ſure to yield ſeveral good crops of corn, and may afterwards again with good ſucceſs be ſown with ſaintfoin; and one principal reaſon why it thrives ſo well on poor lands muſt be the length of the roots, by which it is enabled to reſiſt the parching heat of the ſun better than moſt other graſſes are.

"One thing I muſt notify, which is, that I am by long experience convinced that the land cannot be made too fine for ſaintfoin; it thrives the better for it, and is the more certain to take.

"I have often, with very good ſucceſs, ſown it with oats and barley in the manner clover is ſown, the proportion much about equal to the grain it is ſown with; for as the ſeed of ſaintfoin is much larger and lighter than clover ſeed, of courſe a larger quantity ſhould be ſown: it is much beſt for the plants to come up thick; the ground is thereby ſooner ſtocked, and the weeds are eaſier kept under.

"Some in this county have ſown it in rows with intervals, to afford a better opportunity of deſtroying the weeds; and I have heard that on tolerable rich land, apt to produce weeds, it has done very well in this way; but as I never experienced it, I ſhall not enlarge on that head.

"It is beſt not to feed it the firſt year; but whether it is ſown by itſelf, or with any other crop, it may be mowed the firſt year.

"It is much beſt, if a good crop is deſired, and it is to continue any time to the land, to ſow it in autumn by itſelf, the earlier the better: the proper ſeaſon is from the beginning of Auguſt to the end of September; but if you mix it with other grain, let it be ſown from the beginning of February to the end of March; the earlier in either ſeaſon, the better.

"I have, I think, before obſerved that the land cannot be made too fine for this plant; and it ſhould be well harrowed before ſowing, and again harrowed afterwards to cover the ſeed.

"I muſt once more repeat, that it muſt not be fed the firſt year; for the ſweetneſs of the graſs will cauſe the cattle to bite it too near the ground, which will greatly injure your crop: in fact, it is our practice not to let great cattle feed it till the third year, particularly in grounds that are inclinable to moiſture; for the roots are tender, and much treading is very injurious to it.

"When the ground is well covered, ſuppoſe in the third year after ſowing, if you intend to mow your ſaintfoin, it is beſt to lay it up by the middle of April at fartheſt; but it is better done three or four weeks ſooner. The time for cutting it is when it begins to flower, as it is then fulleſt of ſap: this will ſometimes be about the middle of May, but often later, according as the ſpring is cold or warm.

"In feeding it ſome neceſſary rules are to be obſerved. In the ſpring turn in your great cattle, and you may be pretty certain the buds will not be cropped too near. Oxen thrive well on it, without the danger, at their firſt grazing, that is to be apprehended from clover, &c. yet even this danger chiefly ariſes from the negligence or ignorance of the hinds.

"In the autumn, and part of the winter, you may feed your ſheep on it, which, if in health, will thereby be very ſuddenly fattened.

"Saintfoin hay is excellent food for horſes, and they are uncommonly fond of it.

"If you turn your cows in ſpring in your ſaintfoin lay, you will find it will breed in them abundance of milk; and all my acquaintance know that the butter made of it is excellent.

"When it is intended to ſave the ſeed of ſaintfoin, it is beſt to roll it in the ſpring, that the ſtones may be preſſed down, and the ſcythe go cloſe to the ground; or elſe the beſt ſeeds, which grow on the lowermoſt joints, will be loſt.

"When land is inclined to moiſture, ſaintfoin may thrive very well on it till a wet winter comes; but it is then a great chance if it is not deſtroyed.

"In this county it has long been the opinion of the ableſt farmers, that it is beſt not to dung our ſaintfoin; for the dung ſerves only to encourage weeds, and ſeldom reaches deep enough to give any ſupply of nouriſhment to the roots of the ſaintfoin.

"I have, if I miſtake not, before obſerved that the treading of great cattle, particularly in winter, is hurtful to this graſs: I would therefore by no means adviſe the farmer to fodder his cattle on it, as the field will thereby be poached full of holes, in which the wet lodging, it is a chance but the roots of the ſaintfoin are rotted by it.

"I have often fed my ſheep in winter with ſaintfoin hay; but whenever I intended this, I always cut my ſaintfoin ſome little time before it flowered: it is very eaſy to obſerve when the flower cup is forming: the ſheep will eat it very clean, and thrive well on it, provided it is not old and ſticky.

"When I ſay that ſheep in autumn will fatten very ſuddenly on ſaintfoin graſs, it muſt be obſerved, that I did not mean the aftermath of ſuch as had been mowed that ſeaſon; but the ſecond growth, when the field had been for ſome time ſhut up after the great cattle had fed it in the ſpring. The aftermath is, it is true, good for ſheep; but, I think, not quite ſo good as the aftermath of natural graſs; at leaſt, this I am certain of, that turn ſome ſheep into a field where there is a mixture of natural graſs and ſaintfoin, both of which have been mowed, they will to chuſe eat up the firſt, before they touch the other with any degree of appetite.

"Saintfoin ſhoots very early in the ſpring, and to nip it in the bud is very injurious; I would therefore adviſe that the ſheep be taken out about Chriſtmas, ſoon after which time it often begins to grow.

"Some of our Wiltſhire farmers have had a cuſtom of ſowing their ſaintfoin ſeed under furrow; but I do not much approve of this practice, though they ſay in light land it cannot be buried." *Muſeum Ruſticum, vol.* I. *pag.* 463.

The following method of cultivating ſaintfoin in Switzerland, was written by an experienced huſbandman of that country.

"You have bought, you ſay, a little eſtate, at no great diſtance from the metropolis, and have thought of improving ſome of the lands by ſowing ſaintfoin: you requeſt me to let you know what are the methods in practice in this country relative to that graſs, as, when you left Switzerland to go to our uncle in London, you were too young to gain the neceſſary knowledge in farming. I ſhall oblige you with pleaſure, and the rather as I have had very good ſucceſs myſelf in this particular article.

"The roots of ſaintfoin, ſays he, penetrate very deep into the earth, by which means they do not exhauſt the ſurface ſo much as one would imagine, the vigour of the plant conſidered: the roots are perennial, and conſiſt of a white woody ſubſtance within, covered by a black outward coat or bark: from the crown of the root proceed ſeveral leaves, and ſome branches about two feet long, which incline on all ſides. Our fodder is furniſhed from theſe branches and leaves. Saintfoin is a very vigorous plant, and yields a moſt excellent fodder.

"It is not nice with reſpect to ſoil, but grows in almoſt any, if we except ſuch as are clayey, very damp, and low, or ſtoney: the crop is in proportion to the goodneſs of the land; but the ſaintfoin that grows on poor land, though leſs in quantity, is moſt nouriſhing and heartening for cattle: the virtues of it ſeem concentrated, and the cattle thrive much better on it than on ſuch as grows in greater quantities on rich mellow land.

"When we have it in our power to chuſe our ſituation and ſoil for ſaintfoin, we ought to prefer a light land, gently ſloping on the ſouth ſide of an eminence: here it proſpers to admiration.

"This plant does not thrive in the ſhade; for this reaſon we ſhould avoid having any trees in the fields that bear ſaintfoin: and it is ſubject to be ſometimes chilled, by having ſnow lie too long on it in winter; it ſhould not therefore be ſown on flat level land.

"To have a good crop, the land ſhould be properly prepared, by having two or three good plowings between harveſt and barley ſeed-time: the ſtones muſt be very carefully picked off the field; and it muſt be cleaned from all kinds of weeds, and other ſuch traſh.

"If it is likely that there will be a wet ſeaſon, the ſpring is the beſt time for ſowing ſaintfoin, as it will be much forwarder than that ſown in autumn: but if the ſpring is too dry, the ſowing will be beſt deferred till about Auguſt, as by that means the plants will have time to acquire ſtrength in their roots, and make vigorous ſhoots in the ſpring.

"The farmer may take it for granted, that if the ſoil will admit of it, he cannot well plow his land too deep, or make it too fine: he will reap all the benefit of it in his ſucceeding crops.

"In Switzerland we ſow it three times as thick as we do wheat; or, which amounts to the ſame thing, we uſe the ſame weight of ſeed, the ſaintfoin ſeed being ſo much ſmaller as to make that difference.

"Good ſeed ſhould be heavy, plump, bright, and of a yellowiſh red colour: if, on opening the pods, you find the ſeeds black and ſhrivelled, reject it as of no value; for it has been heated in the heap, and will not grow: if it appears white and ſhrivelled, the plant was cut before the ſeed was ripe; from this you are to expect only ſtarved, meagre, ſhort-lived plants: you muſt therefore by no means ſow it. The pods encloſing good ſeed ſhould be plump, large, and armed on one ſide with ſmall prickles: and they ſhould alſo be of a deep brown colour: but it is beſt not to depend on the appearance of the pods, but open them, and examine the ſeed.

"The weather ſhould be mild at the time of ſowing the ſeed of ſaintfoin; and it ſhould be harrowed in, and not covered with above two inches of earth at moſt: ſome ſow it in the ſpring with oats; but this I by no means approve of: it is much better ſown alone, eſpecially if you would have a ſtrong vigorous plant, that ſhall laſt for years.

"In our very poor lands in Switzerland we ſometimes purſue the following method.

"Immediately after harveſt we give the land intended for ſaintfoin a good deep plowing, laying it in high ridges; in this manner it is left to be mellowed by the froſt and ſnow: we take advantage of the firſt hard froſt to carry on our dung, and manure it well.

"When the froſt breaks in the ſpring, we ſpread the dung and turn it in with the plow: we afterwards beſtow at leaſt two more plowings on the land, not only to keep down the weeds, but to make the land as fine as poſſible: in autumn we ſow wheat, and have reaſon to expect a tolerable good crop.

"When the wheat is got in, the land is again plowed, and left to meliorate and pulverize by the winter froſts: early in the ſpring it is plowed and laid level, the ſtones are

are all picked off, and the weeds cleared away: if rain is expected, it is now sown pretty thick with the saintfoin, otherwise the sowing is deferred till autumn. When poor land is managed in this manner, it will yield tolerable good crops of saintfoin for several years: it should not, however, be fed the first year, as the treading of the cattle will destroy the crown of the plant, and prevent its shooting the succeeding year: and sheep should never be turned in to feed on it, as they will crop it so close as to prevent its budding.

"Saintfoin comes up about a fortnight after sowing it, and if the weather is moist, something sooner. When the plants are come up, they should be set out at a proper distance with a hoe, that they may have room to spread. The young plants are very apt to be choaked by weeds; they must on that account be kept very clear of weeds, till, by their branches, stalks, and leaves, they cover the land; after which there will be no danger of the weeds getting a-head.

"As saintfoin seed is often faulty, it will not be amiss to make a trial of it, by sowing some of it in a detached bed of a garden, counting the seeds before they are put into the ground: by this means it may easily be known how many of them fail, and the quantity of seed to be sown may be proportioned accordingly.

"Some have asserted, that saintfoin should not be mowed the first year: but this is an ideal precaution; for in Switzerland we think it rather does it good than harm to mow it in autumn; and experience every day convinces us we are right in our opinion. The first crop is not, it is true, very large; but the mowing causes the plants to branch, and gives strength to the roots.

"No cattle, as I said before, should be turned on saintfoin the first year: and indeed, it is best, if possible, always to mow it. We have three crops of green fodder, or two of hay, from it, in one season in this country.

"When we intend to save the saintfoin seed, we leave a part of it standing, and do not cut it till we observe, by the colour of the pods, which will then be of a deep brown, that the principal part of the seed is ripe: we then either gather the heads by hand, or reap them with a sickle, and lay them carefully on a cloth. The heads must be dried in layers three or four inches thick: if they were laid thicker, they would be apt to heat and spoil: when dry, we gently thresh them with sticks; flails would be too heavy; for if the seed is the least bruised, it does not come up. The stubble that remains after the heads are cut off may be mowed, and given either dry or green to the cattle; for though a little sticky, they will not refuse to eat it.

"I generally use my saintfoin green, foddering the cattle with it as soon as it is cut; and this I the rather do, because the making it into hay is such critical work: but when there is a likelihood of my being short of winter-fodder, I have no choice to make.

"The weather should be very fine when it is cut; for as it is full of sap, it requires great heat to dry it; and if it happens to rain, it takes more damage than common grass; and it is best not to cock it, as it is subject to heat in a very small space of time: if it is much wetted, it grows black, and loses all its sweetness.

"Even when saintfoin is seemingly quite dry, it is apt to heat in the stack; but this is easily prevented by spreading alternately a layer of good oat or barley straw, and another of saintfoin: when it comes to be used all together, it makes an excellent winter-fodder.

"Great care must be taken both in turning the swarths of saintfoin, and in loading it on the waggons, as a very little stirring will, when it is dry, shake off all the leaves; and this greatly lessens its value: for this reason I make my men turn the swarths with the handles of their forks, which is easily done; and I never cart it, but either early in a morning, or late in the evening, when it is somewhat moistened by the dews.

"Saintfoin is a very hardy plant, and bears, without being sensibly affected, the extremes of heat and cold; but the bottom of the land where it is sown must not be wet, and there must be room for the roots to spread.

"A field of saintfoin on a good soil will last from sixteen to twenty years in prime, and even longer, with care; for if, after seven or eight years, some well-rotted dung is laid on it, the future crops, as well as its duration, will be greatly encreased. When it is sown on light land, marling it is of very great service.

"But if after all a piece of saintfoin falls off, our method is to plow it up in autumn as deep as possible; give it another plowing in spring, sow it with oats, plow it again immediately after harvest, dung it, sow it with wheat; when the wheat is off, plow it again, and giving it another plowing sow saintfoin in it about the end of August; and this in general succeeds as well as that which was first sown on the land.

"Before I conclude, I must give you a few cautions relative to this excellent fodder, which has of late so much improved this neighbourhood.

"It is so very sweet, and cattle are so fond of it, that without great care they are apt to eat too much of it; whence often proceeds a surfeit, and sometimes a corruption of the mass of blood, and cutaneous eruptions: they should at first have but a little at a time given them, that they may be by degrees habituated to it: by this management the danger vanishes.

"It is much more proper for slow draught-horses than for such as are used for berlins, or for riding; for it is apt to make horses thick-winded, foggy, and somewhat sluggish: for farmers horses nothing can be better, or more nourishing; speed is not required in them.

"When saintfoin is intended to be made into hay for horses, it is best not to cut it till the seed is formed in the pod, as by that means the hay will be much more nourishing; and when the dried seed itself is plenty, nothing better can be given to the horses by way of corn; for I can assure you from experience, that one bushel of it will go as far as two of oats.

"When saintfoin is cut to be given green to cattle, it is best to mow it when it is in full bloom, as it is then most juicy, and fullest of sap, and will consequently afford most nourishment to the cattle. The best way of managing is to cut no more than will serve for the day; and by properly apportioning, or parcelling out the field, there will be, during the whole summer, some of it in order to cut for green fodder.

"If this green fodder is intended for sheep, it may with great propriety be cut just before it flowers: the stalks are then in a tender state, and very nourishing and good either for wethers or ewes. When it is to be made into hay for sheep, the same rule should be observed.

"I have very little more to say on the subject of saintfoin, except that, as when a saintfoin lay is brought into tillage, it prepares land very well for wheat or rye, and bears good crops, there is seldom occasion among the good farmers to try how long it will continue in heart, as they generally break up these lays in turn, and find it advantageous so to do." *Museum Rusticum, vol. I. pag. 37.*

Experiments on Saintfoin.

The following judicious series of experiments were communicated by a gentleman of distinguished rank and fortune, in Yorkshire.

"From an entire conviction, says this excellent husbandman, that it is the duty of every subject to contribute all in his power to the good of society; I have endeavoured, during several years that I have resided in the country, to promote and encourage the advancement of agriculture. To this end I have made variety of experiments, on different soils, to prove and ascertain the most beneficial methods of husbandry, or how to employ land to the most advantage.

"A great part of my estate, consisting of waste and uncultivated heath, which did not let for more than a shilling an acre, I judged it to be a matter of importance to try if it was not possible, by culture, or by applying this ground to a different purpose, to increase the value of it. Happy would it be, could pleasure be made to coincide with profit! and it is certain, that whoever succeeds in the improvement of his own estate, may enjoy the inward satisfaction of rendering some service to his country: for the example of a landlord may be thought to have some weight with his tenants; and if, amidst a great number of experiments made for the sake of truth, some have proved fuccefsful, one may expect that the farmer will at laft adopt a method which he has for many years feen repeated with advantage: for however the common farmer may have been accufed of an obftinate adherence to old cuftoms, many inftances might be produced of his quitting the paths of his anceftors in favour of modern improvements; but then he muft be thoroughly fatisfied, that the new way is indeed preferable to the old, not in theory only, but in practice, confirmed by actual experiments often repeated before his eyes. And can we juftly blame the illiterate peafant for refufing to forfake a method he is well acquainted with, and can depend on for the fupport of himfelf and family, upon other terms? It is the province of the landlord to adopt a theory, and to try it by experiment; for if it fails, as is often the cafe, his ruin is by no means the confequence, and the lofs is amply made up to him, by the fecret pleafure always accompanying a good intention. But whatever fervice a gentleman may be of in encouraging refearches of this nature, or by his influence in his own neighbourhood; yet ought his benevolence to extend farther, fo as to be of ufe, if poffible, to his country and mankind. It is the defire of communicating the little knowledge I may have gained from the experience of a few years, that has prompted me to addrefs this letter to you, who are engaged in an ufeful and public undertaking: and you are at full liberty to make ufe of it, together with the detail of the experiments. They were begun without the leaft defign of making them public, and may therefore be deficient in point of method and order: but they are ftrictly true.

" On the third of April, 1759, two acres of very fandy land (which had a hundred loads of red marle laid on it the year before, and had borne a good crop of oats in 1758) were drilled with faintfoin, on four feet ridges in double rows, eleven inch partitions, the intervals three feet one inch wide, and took four pecks and a half of feed. This was intended to be horfe-hoed, as Tull directs; but the land was in fuch bad tilth, and abounded fo with the natural grafs, that, after once or twice attempting to deftroy it, by plowing the intervals, the horfe-hoeing fcheme was given up, and the faintfoin left to take its chance. However, a few plants remained thinly fcattered in the rows (whether this thinnefs was owing to the badnefs of the feed, or to its being fown too deep, I know not, though I rather impute it to the latter caufe, as, in fandy land, the fhares of the drill are very apt to penetrate too far into the ground.) Thefe remaining plants flourifhed exceedingly from the time of their being fown; many were in flower the following June, and afforded a tolerable crop, viz. about a load. The after-eatage was very good. In 1760, thefe plants feemed to have arrived at their perfection, and the product was two waggon loads, or about two tons. In 1761, and 1762, this fmall clofe, having had fome manure laid on it yearly, yielded nearly the fame quantity of hay; and it is now let for forty fhillings a year: a much higher rent than any land is let for in this neighbourhood, and four times the rent paid for it before the improvement.

" N. B. This clofe of two acres was feparated from another of twenty-feven acres, of fo fandy and dry a nature, that, unlefs in a wet fummer, the hay upon it was fcarce ever worth mowing: and this experiment was made in order to determine what improvement the adjoining large clofe was capable of, and to experience whether or no the common opinion, that faintfoin is improper for all fandy and deep foils, be founded on truth, or only the refult of prejudice: for the reafon given for its difagreeing with this kind of foil, did not appear to me fatisfactory; and great part of my eftate confifting of fuch fandy land, it feemed a matter of importance, to know, whether the great advantage derived from faintfoin, on fome foils, might not alfo be applicable to fandy foils.

" Encouraged by the flourifhing condition of the faintfoin on this fmall clofe, I determined to extend the improvement to the larger one alfo, as foon as it could be brought into fufficiently fine order to be laid down with this grafs. Accordingly, in the winter of 1759, twenty-five acres were plowed with the five coultered plough, as recommended by M. Duhamel, in his Treatife on the Cultivation of Land, in order thereby to prepare the ground for turneps the enfuing fummer: for I look upon this as one of the beft methods of deftroying the natural grafs, and preparing the land for any of the artificial graffes; efpecially if the turneps are drilled in rows, and cultivated with the horfe-hoe. The land was plowed level in the fpring of 1760, and into ridges of about five feet broad in June, and a fingle row of turneps was drilled on the middle of each ridge in July. It is to be obferved, that the natural grafs was far from being deftroyed by thefe three plowings; nor could it be entirely fo by the fubfequent hoeings of the turneps; fo that it certainly was a great prejudice to the faintfoin. The fame ground is now fown again with the fame plant: but I would ftrongly recommend to thofe who are inclined to follow this method on fuch a foil as I have defcribed, to continue the culture of turneps, with the horfe-hoe, two years, inftead of one: for by this means, the natural grafs and weeds may probably be effectually deftroyed. But to return to the experiment: the turneps fucceeded as well as could be expected on fuch a foil, and without manure: they were eaten off by fheep, and Scotch cattle, folded on the land.

" About four acres, on which the turneps were the firft fpent, were plowed level, and afterwards, viz. in November, drilled with faintfoin in equally diftant rows, one foot afunder. They took about a bufhel to an acre. This was an uncommon, and may be thought an improper feafon for the fowing of faintfoin: but I chofe to fow part of the field before winter, and part in the fpring, part with faintfoin mixed with corn, and part with faintfoin alone; in order to fee which method would fucceed beft, that I might make it my guide in other places, more likely to yield good crops.

" Five or fix acres of land were drilled in the beginning of April 1761, with faintfoin feed, in rows, at the fame diftance, and with the fame proportion of feed, as the four acres fpoken of before: about three acres were fowed foon after with faintfoin and oats, both drilled: and about twelve acres were drilled with faintfoin and barley; each in rows, about a foot afunder. The whole of this field, which contained twenty-five acres, had been plowed but once fince the turneps; whereas two plowings might have been better: but, on account of eating them off with fheep and cattle, there was not time for it.

" The three acres fowed with oats in rows a foot afunder, took four bufhels and a half of feed, and produced a very good crop; by computation, five quarters to an acre: but the exact quantity, neither of the oats, nor of the barley, could be known, on account of its being mixed in the barn with corn that grew in other places. The twelve acres fowed with barley took feventeen bufhels of feed, and produced a much greater crop than any land in the neighbourhood; though this was a great year for barley. All the farmers who obferved this crop, allowed that they had never feen finer barley; and it may be faid, without the leaft exaggeration, to have yielded above five quarters to an acre. I am convinced that this computation of five quarters to an acre is a very moderate one; not only from the number of fheaves, and the judgment of all who faw it; but likewife becaufe I had no more than twenty-fix acres and an half of land drilled with barley this year; and the whole produce, when threfhed, amounted to one hundred and twenty-eight quarters and two bufhels; which is very near five quarters to an acre, taking one part with another: but thefe twelve acres bore by much the greateft crop in proportion, and feven acres of the twenty-fix were fown on beds five feet broad, and horfe-hoed, which never produces fo large a crop.

" The fummer of 1762 was remarkably dry, and bad for grafs: many fields hereabouts, of ten acres, did not produce above a load or two of hay; but this of twenty-five acres produced twelve tons of good hay: which, confidering that the faintfoin was not nearly arrived at its perfection, may be faid to be confiderable.

" It was now eafy to fee in what parts of the field the faintfoin had fucceeded beft.

" The four acres fowed before winter had the fmalleft number of plants of faintfoin of any; perhaps not more than one or two in ten yards: but this ground abounded fo with natural grafs, that this alone furnifhed a tolerable crop. The five acres fown in the fpring, without corn, did

did not abound much lefs with natural grafs, or more with faintfoin, than the preceding: but there being a great mixture of the feeds of rye-grafs with all the faintfoin fowed in this field, the rye-grafs appeared diftinctly in tufts all along the rows; and, together with the natural grafs, feemed compleatly to have covered the furface of the ground. The rows were much better ftocked with faintfoin plants in the twelve acres fown with it and barley: but the rye-grafs abounded here likewife.

"It is remarkable, that the faintfoin flourifhes beft in thofe parts of the field where the land is moft barren; the reafon of which undoubtedly is, that, as fcarce any natural grafs, or weeds, arife to choak it there, its young and tender fhoots have the benefit of the whole pafture, and its roots are not obftructed in their progrefs by the growth of other plants.

"Though the greateft part of this field is much underftocked with faintfoin plants, yet it is in a very promifing condition for a good crop of hay this year.

"I attribute the bad fuccefs of the faintfoin on the firft four acres, partly to its being fowed too late, whereby the plants could not acquire much ftrength before winter, which deftroyed many of them; partly to fome violent hurricanes of wind, which blew clouds of fand from one part of the field to another, and overwhelmed many plants; and partly to the fhares going too deep, by which the feed was covered at leaft two inches. The bad condition of the five acres fowed alone in the fpring, I believe to be owing, in fome meafure, to the caufes already affigned, and alfo to the want of protection and fhelter from drought, which corn would have afforded in that very dry foil. Barley does alfo help to ftifle the natural grafs, faintfoin's greateft enemy. The faintfoin which was drilled with barley, looked, as was before obferved, by much the beft: but, indeed, fome precautions were ufed to fow the feed fomewhat fhallower on thefe twelve acres; and this may, in fome degree, have contributed to its fuccefs.

"Upon the whole, from the experiments made in this field (and feveral others made fince have ftrengthened my opinion on that head) I conclude, firft, that faintfoin is very fuitable to any fandy or deep foils, provided they are dry, and that the natural grafs and weeds can by any means be completely deftroyed: fecondly, that it is better to fow faintfoin in the fpring, and with barley, than in the autumn, or fpring, alone: thirdly, that the feed fhould not be covered above an inch deep; but I believe half an inch the moft proper depth. One foot may be a very proper diftance for drilling the rows; and from a bufhel to a bufhel and an half, a proper allowance of feed for an acre of ground, provided that feed be good.

"I have tried the horfe-hoeing of faintfoin fown on beds three and four feet broad: but, though the plants do by that means certainly grow more vigorous, I do not think the crop fo great; and when the ftalks are ftrong and pipy, I have obferved that cattle will not eat them. The fowing in equally diftant rows feems preferable, efpecially where a large extent of ground is to be fowed. But my experience is very infufficient to decide this point abfolutely. I could wifh that gentlemen would make trials of the horfe-hoeing of faintfoin in different foils and fituations.

"Experiments carefully made, and often varied, by perfons void of prejudice, may, in time, decide that important queftion in agriculture, viz. whether the common, or the horfe-hoeing, hufbandry be, upon the whole, moft advantageous to the Englifh farmer.

"If faintfoin be drilled on a fandy foil, or on one that is in very fine order, the fhares of the drill ought to be two inches thick, or they will go too deep; and a fmall wooden roller fhould be fixed to, and follow, the drill, inftead of a harrow with teeth, which would bring too much earth upon the feed. Such a roller will lay the ground fmooth, and fitter for mowing. A fpring made of three pieces of afh, as defcribed by M. Chateauvieux, is of great ufe, and may eafily be added to Mr. Tull's drill plough. It may be faftened underneath the middle of the plank, by four fcrews, and made to prefs more or lefs on the roller, or harrow, which ever is made ufe of, by a wedge put in betwixt the fpring and the hinder edge of the plank. If a harrow is ufed, iron teeth are much preferable to wooden ones.

"In the year 1757, I had a mind to try how much a foil naturally extremely bad, could be improved by art. Accordingly, I made choice of a piece of ground one acre and an half in extent, a barren fand, which produced only a few miferable weeds, and which the farmer who rented it did not think worth his while to cultivate. There happened to be a great quantity of red ftony marle in an adjoining field, of which near three hundred loads were laid on this acre and an half. It was drilled with barley in 1758, and horfe-hoed: but the crop proved a very bad one. In 1759, a load of lime, and about ten loads of dung were laid thereon, and it was drilled with turneps and horfe-hoed: however, the crop ftill was but moderate; though a good deal better than could have been expected from fuch a foil. In 1760, it had turneps again, managed in the fame manner as the former, but they were a great deal better. In 1761, it was drilled with oats, faintfoin and rye-grafs, mixed, in equally diftant rows one foot afunder. It took two bufhels and a peck of oats, and two bufhels of grafs feeds. The oats were very good, and produced four quarters and four bufhels. By continued horfe-hoeing three years together, the land was got into perfectly fine order, the marle and fand were thoroughly incorporated, and the natural grafs and weeds intirely deftroyed: fo that the faintfoin and rye-grafs grew and flourifhed exceedingly. In 1762, the fummer being uncommonly dry, the produce was about half a load of hay; which was as much as one could expect the firft year after fowing. It is very well flocked with plants, which now, in May 1763, feem as vigorous as in any of my other fields, though I have fome which yield two tons of hay to an acre. This little piece of ground, which before was not worth a fhilling a year, is, by the labour and coft beftowed on it, now worth at leaft fifteen fhillings an acre; which is a proof that, let land be ever fo bad, it may be improved, and perhaps made equal to the beft in the neighbourhood: but at the fame time it muft be confeffed, that the expence is too great to be repeated at once on a large extent of ground. I calculate that three hundred loads of marle, dug and carried about three hundred yards, might coft about four pence a load, or five pounds for three hundred loads, which has been the whole expence attending this acre and half: for the manure, plowings, and horfe-hoeings, were repaid by the crops of barley, oats, and turneps."

Mr. Duhamel has mentioned the following experiments relative to the culture of faintfoin:

In 1754, M. Eyma, near Bourdeaux, planted faintfoin, lucerne, and clover, in rows eight feet afunder, with diftances of fixteen inches between the plants in the rows, which yielded him an immenfe increafe. The alleys were horfe-hoed after each cutting.

In 1755, he planted a field, a little more than three roods fquare, with faintfoin, which he cultivated according to the rules of the new hufbandry; and this fpot yielded him 10,000 pounds of dry hay. M. de Chateauvieux had 15,300 pounds of lucerne, as we fhall fee, off fomewhat more than an acre of ground, which he cut five times: but M. Eyma thinks that 14445 pounds, Geneva weight, of faintfoin, which he had at another time, at one cutting, is a greater crop than M. de Chateauvieux's lucerne; befides the after crop, which indeed was but inconfiderable, on account of the drynefs of the feafon. He fays he cuts his faintfoin three times in good years, and that the two laft cuttings produce nearly as much as the firft: but he allows, that fuch years are not to be expected often.

M. Eyma doubts whether the preference be due to faintfoin, or to lucerne: but he is confident that either of them, properly cultivated, will produce furprizing crops.

He thinks that one row of faintfoin, or lucerne, planted in the middle of a bed three feet wide, will profit more by the different hoeings, and confequently produce more grafs, than double or triple rows, though thefe laft be planted on broader beds; becaufe the fingle rows have the earth loofened on each fide of them.

M. Diancourt fowed faintfoin, each plant of which, in 1753, had a head of two feet diameter. They throve fo well, that, in 1755, one plant, and that not the largeft in the field, yielded twenty-three ounces of hay.

The following inftructions were given by an ingenious gentleman in Lincolnfhire.

"Mr. Tull ſays, that a deep ſoil is beſt for ſaintfoin. I believe every thing grows better, in a better ſoil: but by what I have ſeen of this plant, I ſhall always prefer for it a ſhallow ſoil, where there is a rock, or ſome hard ſubſtance, within ſix inches, or a foot, of the ſurface, to ſtop the roots of the plants, and make them ſpread horizontally. This has not only the good effects propoſed in M. de Chateavieux's manner of tranſplanting lucerne, but, it is ſaid, occaſions its filling the ground with more ſhoots by their ſtriking up from the knots of the roots. This fact I cannot verify: but certain it is, that, in ſuch ſoils as I here ſpeak of, a crop of ſaintfoin which at firſt appears very thin, will afterwards fill the ground perfectly well, and the plants of it will appear in much greater quantities than at firſt.

"I have ſeveral times broke off a root of ſaintfoin four or five inches within ground, and it always ſprang up again. This is a ſmall argument for the fact I mentioned.

"Saintfoin is much cultivated in Lincolnſhire. The common allowance of ſeed is five buſhels to an acre. A gentleman ſouth of Lincoln adviſed me always to ſow a ſmall quantity of trefoil with it (about four pounds on an acre). The reaſon is, that, in this expoſed country, the young plants ſuffered more by the ſun in ſummer, than by the froſts in winter. Now the trefoil, coming to perfection the firſt year, and living only three, will be a ſhelter for the young plants, during the firſt year or two, and die off when the ſaintfoin wants its room. This ſyſtem is well ſupported by practice: but rye graſs ſhould on no account be ſowed with it; that being, when left for fodder, a great impoveriſher of ground.

"Saintfoin is obſerved to get to perfection in three years, laſts good four or five, and then dwindles during four or five more. Its firſt crops are from one or two loads; its ſecond-ſtage, from three to four loads, and it dwindles down again to one.—Laſt ſummer, which was remarkably dry, did very well with this graſs.

"I have ſown ſaintfoin with barley, with wheat, without corn in the ſpring, and now" (this gentleman's letter is dated September 4th, 1763) "am ſowing ſome more at this preſent writing; but can form no judgment as yet.

"Three years ago I drilled ſome, according to Mr. Tull's directions, in beds, with treble rows, and ſome at equi-diſtant rows. The horſe-hoed beds were good, as far as they went: the others, drilled at a foot diſtance, gave ſo much room for weeds to come up, that the ſucceſs was very moderate; which, indeed, would have been the caſe with the former, had not the horſe-hoe cleared them. On the whole as far as my ſmall experience and obſervations reach, I would never chuſe any one to drill his ſeed, but to ſow it in the broad caſt-way, on land very fine, with a good quantity of ſeed."

SALLENDERS, a diſeaſe in horſes, conſiſting in cracks in the bending of the hough, and occaſion a lameneſs behind. This diſeaſe is cured in the ſame manner as the mallenders. *See* MALLENDERS.

SALT-MARSHES, paſture-lands lying near the ſea, and ſometimes overflowed by the ſea-water.

"It has been obſerved, ſays an ingenious writer in the Muſeum Ruſticum, that horſes and black cattle thrive better, and get fleſh and fat ſooner, in ſalt marſhes, than in freſh-water meadows or upland paſtures; yet I do not remember ever to have heard any good reaſon aſſigned for it.

"Some will tell you that the air of the ſea whets their appetites; that the paſture is rich and nouriſhing; and that the herbs produced by the lands near the ſea are more conducive to the health of herbaceous animals, than ſuch as grow on upland paſtures, whether natural or artificial.

"But may we not rather attribute the thriving of cattle on theſe marſhes, to the ſaline particles with which the earth as well as its produce, is, when near the ſea, ſtrongly impregnated? Perhaps even the dews have their portion of ſalt; but of this I have made no experiment, therefore mention it only as a probable conjecture; for as they fall ſoon after they are exhaled from the ſea, without paſſing through the ſecretions neceſſary to ſeparate their ſaline parts, why ſhould not this be the caſe?

"But to return to my firſt ſubject: I am fully of opinion, that the ſaline particles only, with which the graſs is impregnated in the above-mentioned marſhes, cauſe cattle to thrive in them in the manner they are known to do. Theſe ſalts purge away the foul humours which the beaſts have contracted, either by idleneſs, or by being overheated in labour; by which means they are better diſpoſed to be nouriſhed by the aliment they receive.

"It may, perhaps, be objected, that if the graſs of theſe marſhes is apt to purge cattle, this very purging, by being long continued, will be a means of preventing their growing fat. To this I anſwer, that the cattle take with their food every day nearly the ſame quantity of theſe purgative particles; but that the quantity of ſalt, which at their being firſt put into the marſh will have that effect, will ceaſe producing it when they are, by cuſtom, habituated to take a daily portion of it: this muſt be allowed, as we all know, that a few grains of rhubarb will operate as a cathartic to a perſon that is not accuſtomed to take it; yet it is as well known, that a man may take many grains daily, if he uſes himſelf to it, without its being ſenſibly purgative to him.

"It is not convenient to every one to ſend their cattle to a ſalt marſh: would it not, therefore, be happy, if we could ſubſtitute a method that would nearly anſwer the ſame purpoſe? I do not think this impoſſible: perhaps, if common ſalt-water was to be laid in the fields for the horſes to lick as often as they pleaſed, they would thrive much better: were I to ſay I know it would have that effect, it would be no preſumption.

"Cattle are naturally fond of ſalt, and if left at their liberty, will take no more of it than what does them good. With this help, our freſh-water meadows, and upland natural and artificial paſtures, would yield us a greater profit, and of courſe be worth more both to the land-owner and farmer.

"Some will not allow a thing to have merit; unleſs it is ſupported by what they call a proper authority; and they do not allow the experiments of a particular perſon to be ſufficient. To ſatisfy ſuch I can aſſure you, that in the inland parts of Switzerland, when their horſes and cattle have endured the hardſhips of a long and ſevere winter, they turn them in the ſpring looſe into the mountains, laying ſalt here and there upon the rocks, for them to reſort to when they pleaſe; and of this they are ſo fond, that when the farmers want to catch their horſes, they take ſome ſalt in their hats, as we do oats in a ſieve, to allure them.

"Experience has long convinced them, that the ſalt thus laid in their way anſwers every good purpoſe: their cattle are more healthy in general than ours are in England; and almoſt to this alone do they attribute it.

"In the province of Munſter and Connaught, in Ireland, they very frequently lay ſalt on ſlates, for the benefit of their horſes when at graſs: this, they find, does the cattle great ſervice; and in this ſhould we imitate them, and not be too proud to learn of them, becauſe in Ireland agriculture is not in ſo flouriſhing a ſtate as in England.

"Some few farmers have (to do them juſtice) practiſed this method in our own country; but contenting themſelves with the profit reſulting from it, they have not propagated the knowledge of the many advantages they are ſenſible may be derived from this practice of giving ſalt to cattle.

"The farriers and horſe-jockeys know well the uſe of ſalt; they mix it often in their medicines, and find, by experience, that nothing proves ſo powerful a ſtomachic to horſes, as a little ſalt thrown into their oats.

"I muſt farther obſerve, that the uſe of ſalt is very proper when cattle are turned into clover, lucerne, or coleſeed to feed: it is well known, that, on theſe occaſions, they are very apt, unleſs great care is taken, to be ſurfeited; the ſalt would prevent this accident, and thereby greatly accelerate the fattening of the cattle, and make it much ſafer to the farmer.

"Salt has alſo been found to be of great ſervice in fattening hogs, by cauſing them to drink more plentifully than otherwiſe they would."

For the uſes of ſalt in rendering hay more grateful to cattle, *ſee the article* BRINING *of* HAY-RICKS.

SAND, a genus of foſſils found in minute concretions, forming together a kind of powder, the genuine particles of which

which are all of a tendency to one determinate ſhape, and appear regular, though more or leſs complete concretions; not to be diſſolved or diſunited, by water, or formed into a coherent maſs by means of it, but retaining their figure in it; tranſparent, vitrifiable by extreme heat, and not diſſoluble in, nor effervеſcing with acids.

Theſe are ſubject to be variouſly blended and intermixed either with homogene, or heterogene particles, particularly with flakes of talc; and according to theſe, and their different colours, are to be ſubdivided into ſeveral kinds, as red, white, &c.

Dr. Liſter divides the Engliſh ſands into two claſſes; the firſt, ſharp or rag ſand, conſiſting of ſmall tranſparent pebbles, naturally found on the mountains, and not calcinable: theſe he farther divides into fine and coarſe, and ſubdivides each, according to the colours, into white, grey, reddiſh, brown, &c.

The ſecond, ſoft or ſmooth, which he ſubdivides into that with flat particles broken from lime-ſtones, that with ſilver-like particles, and that with gold-like particles.

As to ſand, its uſe is to make the clayey earth fertile, and fit to feed vegetables, &c. for earth alone, we find, is liable to coaleſce, and gather into an hard coherent maſs, as is apparent in clay: and earth thus embodied, and, as it were, glued together, is no-ways diſpoſed to nouriſh vegetables: but if with ſuch earth, ſand, &c. i. e. hard cryſtals, which are not diſſolvable in water, and ſtill retain their figure, be intermixed, they will keep the pores of the earth open, and the earth itſelf looſe and incompact, and by that means give room for the juices to aſcend, and for plants to be nouriſhed thereby.

Thus a vegetable, planted either in ſand alone, or in a fat glebe, or earth alone, receives no growth or increment at all, but is either ſtarved or ſuffocated; but mix the two, and the maſs becomes fertile. In effect, by means of ſand, the earth is rendered, in ſome manner, organical; pores and interſtices being hereby maintained, ſomething analogous to veſſels, by which the juices may be conveyed, prepared, digeſted, circulated, and at length excerned, and thrown off into the roots of plants.

Grounds that are ſandy and gravelly, eaſily admit both of heat and moiſture; but then they are liable to theſe inconveniencies, that they let them paſs too ſoon, and ſo contract no ligature, or elſe retain it too long, eſpecially where there is a clay bottom; and by that means it either parches or chills too much, and produces nothing but moſs, and cankerous infirmities; but if the ſand happens to have a ſurface of good mould, and a bottom of gravel, or looſe ſtone, though it do not hold the water, it may produce a forward ſweet graſs; and, though it may be ſubject to burn, yet it quickly recovers with the leaſt rain.

Sea ſand is accounted a very good compoſt for ſtiff ground; for it effects the two things following, viz. it makes way for the tree or feed to root in ſtiff ground, and makes a fume to feed it.

Sand indeed is apt to puſh the plants, that grow upon it, early in the ſpring, and make them germinate near a month ſooner than thoſe that grow upon clay, becauſe the ſalts in the ſand are at full liberty to be raiſed, and put into motion, upon the leaſt approach of the warmth of the ſun; but then, as they are haſty, they are ſoon exhaled and loſt.

It is remarkable that ſand, though it appear a very hard, denſe, and indiſſoluble body, yet is contained inviſibly in the brine, or ſalt water of our ſalt ſprings; and even on the ſhooting of the ſalt, after evaporation, there ſtill remain the particles of it in the clear pellucid ſalt; and this, though wholly ſoluble in water, yet when a brine, made by ſuch a ſolution, is boiled, depoſits as much of the ſand as the common brine of the pits, or ſea water.

Dr. Plot, who was very curious to know the true hiſtory of this ſingular effect, procured experiments to be made in the following manner: eight folds of fine holland, and as many of much finer cambric, were put together, and, a quantity of the brine of the Staffordſhire ſalt pits being ſtrained through this, there was nothing ſeparated from it but a ſmall quantity of black duſt, which ſeemed to have fallen in by accident, and which was not at all like ſand; yet, on evaporating this brine, it was found to contain no leſs than one fourth part as much ſand as ſalt; the quantity of brine, yielding a buſhel of ſalt, yielding alſo a peck of ſand.

Some have ſuppoſed from theſe, and the like obſervations, that the ſand was generated during the time of the boiling the liquor, but the more careful examiners think otherwiſe; it appearing to them, that the particles of this ſand may be ſeen in the brine, by the help of a microſcope, before the boiling, in form of rectangular oblong plates, ſome nearly ſquare; theſe were ſo ſmall, as readily to paſs the ſtrainer with the water; and appearing as numerous in it after, as before the ſtraining, ſhew that they are no more to be kept, by ſuch means, than the ſalt.

The pores of the fineſt ſtrainers, examined by the microſcope, appear twenty times bigger than theſe plates, or particles of the ſand, and therefore it is not to be wondered at, that they let them through. There requires, therefore, no more to the formation of the ſand, than the coaleſcing of ſeveral of theſe particles into one larger granule, and ſo on; and this is very likely to be done by means of the evaporation of a part of the fluid which kept them ſeparate, and of the motion given to them in boiling, which naturally and neceſſarily brought them into the ſpheres of their own mutual attractions, at a time when their attraction with the fluid they ſwam in, was alſo much diminiſhed with its quantity. This attraction ſeems even evidently to increaſe between the particles, as the water becomes evaporated, and, when finally the ſalt is drawn from it, and it is examined, as it drops from the baſkets, in which the ſalt is put to drain, it is ſeen to contain more numerous particles of this ſandy matter than before; and theſe are found to coaleſce into yet larger concretions, by degrees, as the remainder of the fluid evaporates from them on the glaſs.

The particles of this ſtony matter, when once thus united, are no more to be ſeparated by water, nor is the matter any longer ſoluble in that fluid. The common ſpar found in form of ſtalactites and incruſtations on the roofs, walls, and floors of old caverns, ſhews that it was once diſſolved in water, and by that means brought to thoſe places, and made into thoſe forms; and it ſhould ſeem, that this ſand, as it is called, was only this ſort of ſpar, which is contained more or leſs in all water; and which, on the evaporating of that water and ſeparation of the ſalt, which might help in making the water a menſtruum proper for the retaining it, ſhoots out into its own natural concretions; for the figure of theſe thin plates is the true and natural thin parallellopiped or rhomboidal figure of the ſmaller concretions of that matter, and even of thoſe pieces into which it falls on breaking. *Phil. Tranſ.* N°. 145.

Common ſand is a very good addition by way of manure to all ſorts of clay lands; it warms them, and makes them more open and looſe. The beſt ſand for the farmers uſe is that which is waſhed by rains from roads, or hills, or that which is taken from the beds of rivers; the common ſand that is dug in pits never anſwers nearly ſo well. Sand mixed with dung is much better than laid on alone: and a very fine manure is made by covering the bottom of ſheep-folds with ſeveral loads of ſand every week, which are to be taken away, and laid on cold ſtiff lands, impregnated as they are with the dung and the urine of the ſheep.

Beſides clay land there is another ſort of ground very improveable by ſand; this is that ſort of black foggy land on which buſhes and ſedge grow naturally, and which they cut into turf, in ſome places. Six hundred load of ſand being laid upon an acre of this land, according to the Cheſhire meaſure, which is near double the ſtatute acre, meliorate it ſo much, that without plowing, it will yield good crops of oats or tares, though before it would have produced ſcarce any thing. If after this crop is taken off, the land be well dunged, and laid down for graſs, it will yield a large crop of ſweet hay.

Once ſanding this land will improve it for a vaſt number of years, and it will yield two crops of hay in the year, if there be weather to make it in. Some land in Cheſhire has been, by this means, rendered of twelve times it former value to the owner. The bogs of Ireland, when drained, have been rendered very fruitful land, by mixing ſand in this manner among the earth, of which they conſiſt. Add to this, that in all theſe boggy lands, the burning them, or firing their own turf upon them, is alſo a great advantage. The common peat, or turf aſhes, mixed with the ſand for theſe purpoſes, add greatly to its virtue.

Sea

Sea ſand, which is thrown up in creeks and other places, is by much the richeſt of all ſand for manuring the earth; partly its ſaltneſs, and partly the fat and unctuous filth that is mixed among it, give it this great virtue. In the weſtern parts of England, that lie upon the ſea coaſts, they make very great advantages of it. The fragments of ſea ſhells alſo, which are always in great abundance in this ſand, add to its virtues; and it is always the more eſteemed by the farmers, the more of theſe fragments there are among it.

The ſea ſand uſed as manure in different parts of the kingdom is of three kinds: that about Plymouth, and on other of the ſouthern coaſts, is of a blue grey colour like aſhes, which is probably owing to the ſhells of muſcles, and other fiſh of that or the like colour, being broken and mixed among it in great quantity. Weſtward, near the land's end, the ſea ſand is very white, and about the iſles of Scilly it is very gliſtering, with ſmall particles of talc; on the coaſts of the north ſea the ſand is yellowiſh, brown, or reddiſh, and contains ſo great a quantity of fragments of cockle ſhells, that it ſeems to be chiefly compoſed of them. That ſea ſand is accounted beſt, which is of a reddiſh colour: the next in value to this is the bluiſh, and the white is the worſt of all.

Sea ſand is beſt when taken up from under the water, or from ſand banks, which are covered by every tide.

The ſmall-grained ſand is moſt ſudden in its operation, and is therefore beſt for the tenant who is only to take three or four crops; but the coarſe or large-grained ſand is much better for the landlord, as the good it does laſts many years.

Where the ſand is dredged out of the ſea, it is uſually twice as dear as where it is taken from the ſand banks.

When the land has been well manured with the large ſand, they take four crops of corn from it, and then lay it down for paſture for ſix or ſeven years before they plow it again. The graſs is ſo good, that they commonly mow it for hay the firſt year; it always abounds very much with the white-flowered clover. If the graſs grows but ſhort, it is the farmer's intereſt to feed his cattle upon it, and it will turn to as good account this way, being very ſweet and rich, and making the cattle fat, and the cows yield a very large quantity of milk. *Mortimer's Huſbandry.*

SAND-*Flood*, a terrible diſaſter incident to the lands of Suffolk, and ſome other parts of England, which are frequently covered with vaſt quantities of ſand, rolling upon them like a deluge of water, from ſandy hills in their neighbourhood.

Violent winds break through the turf that covers theſe hills, and then the ſand, lying looſe and naked, is ſoon carried down upon the plains, where it covers and buries the graſs, and in a very little time eats through the light turf, and mixing itſelf with the ſand underneath, becomes one bed of this dry matter never to be covered with turf again. A large body of ſand being thus got together, nothing ſtops its progreſs; but it, at every ſtorm, rolls over more and more ground, ſo that in a few years it extends itſelf a vaſt way, eſpecially where the ground, over which it paſſes, is of the ſame ſandy nature, and only covered with a thin turf.

In ſome parts of Suffolk the ground encourages this change ſo greatly, that a bed of ſand broke looſe from a neighbouring hill, and covering only a few acres, perhaps eight or ten, will, before it has travelled four miles forward, which it does in a ſmall courſe of years, deluge a thouſand acres. It travels down hill faſter than any way elſe, but will not be ſtopped by aſcent, but will move up the ſteepeſt hill, only that it requires more time. The making of fences, in the common way, to keep it out, is vain. It runs through the hedges, and flies over the tops of the banks; and when it reaches a village, in its courſe, will bury the cottages, unleſs preſerved at more charge than they are worth. It will in a very little time beat up to the eaves of a houſe, of the low kind, that are uſually built in a country village, and has often weight enough to break down walls in its paſſage.

The beſt way of ſtopping its progreſs is by hedges of furze, planted one over another, as they become levelled; theſe, if well kept up, will, by degrees, ſtop or divert the progreſs; and ſome who have tried this, with reſolution, after they have had the ſand raiſed twenty feet high, have found it ſtop its increaſe, and then, having manured this adventitious ſoil with dung, found it as good ground as that which made the ſurface before.

About Thetford, the villages were wholly deſtroyed by this about ninety years ago, and the branch of the river Ouſe, called then Thetford river, ſo blocked up by it, that very ſmall veſſels only could go up it, where very large ones uſed before. The river has been of great ſervice in ſtopping its progreſs into Norfolk, where otherwiſe its courſe would have carried it, and its vaſt ſpreading ſideways, in proportion to its going forward, would have made it bury vaſt quantities of land in a few years.

The moſt probable conjecture, as to the cauſe of this ſtrange ſort of deluge in theſe parts of England, is, that this portion of the county of Suffolk lies eaſt-north-eaſt of a part of the great level of the fens, and is by this expoſed to very impetuous winds, which acquire more than ordinary force, by their paſſing through ſo large a tract of country uninterrupted; the ſtorms ſeem to be one great cauſe of the miſchief, and the ſandy nature of the ſoil the other. There are old ſtories, in the country, of ſuits at law commenced among the farmers, for grounds blown out of the owners poſſeſſion; but the people who gain this ſort of wandering land are the greateſt ſufferers. A little ſand ſprinkled by the winds over a tract of land, where there is a bed of ſand under the turf, ſoon eats through that obſtacle; and what was at firſt only a thin coat of ſand, becomes then a deep plain of it, capable of being blown away to the depth of eight, ten, twenty, or more feet, and is carried over every thing in its progreſs before the winds, when once taken up by them. *Philoſophical Tranſactions*, N°. 37.

SAND-*lands, or Sandy-lands*, a term uſed by our farmers to expreſs ſuch grounds as conſiſt wholly of a pure ſheer ſand.

This is of different colours, as white, blackiſh, reddiſh, or yellowiſh, and is very different in its nature, and in the ſize of its particles, ſome being harſher and ſome milder, and ſome very light, ſeeming only to be mere duſt. The grey, black, and aſh-coloured ſand-land are the worſt of all, and generally are found on heaths and commons. Gravelly lands approach much to the nature of theſe, and thoſe which conſiſt of the largeſt ſtones, and are mixed with the harſheſt ſands, are of all the moſt barren.

The propereſt plants for arable land, of this kind, are white oats, rye, black wheat, and turneps. The natural produce, in weeds, is quick graſs, ſorrel, broom, furze, fern and heath.

The beſt manure for them is either marl, or ſuch clay as will break with the froſts. Cow dung is alſo a good manure for theſe lands, and many uſe with ſucceſs chalk, mud, and the half rotten ſtraw from dunghils.

When the farmer has a mind to raiſe corn on theſe lands, he muſt order them the ſame as they do the clays; but where they are over-run with broom, furzes, and ſuch ſort of weeds, marle is to be laid on in great quantities. This is the practice in Staffordſhire, and by it they rid themſelves of theſe troubleſome weeds, and procure good crops of corn, though at ſome expence.

The firſt ſowing of this land is with black wheat, and for this they make three fallowings in winter, and ſtir them in the May following; at this time they ſow them, allowing one buſhel of ſeed to an acre, which generally yields them ſixty again. Then once plowing theſe lands, after this crop is off, they are fit to ſow rye on.

In Oxfordſhire, they ſeldom give theſe lands more than two fallowings for wheat, except they are very much over-run with weeds; and they eſteem the white and Lammas wheat the moſt agreeable for this ſort of land, and then after a fallow rathripe barley. They afterwards generally fallow them every other year, and reckon them unfit for beans and peas, though they ſometimes ſow them with winter vetches. If they ſow peas on them, they eſteem the rathripe kinds the beſt.

In Herefordſhire, they are much ſubject to moſs growing upon their ſandy lands, and they make a great improvement by burning it on the ground, and mixing the aſhes with lime, which they plow in.

They generally ſow them with rye after this manure, and that yields a very great increaſe upon them, and brings on a very good kind of graſs, if they are laid down after a crop or two. *Mortimer's Huſbandry.*

SAP,

SAP, a juice furnifhed by the earth, and changed into the plant, confifting of foffil, faline, aerial, and other particles from putrified animals, vegetables, &c.

The notion of the fap's circulation was entertained by feveral authors much about the fame time, without any communication from one another; particularly M. Major, a phyfician of Hamburgh, M. Perrault, Mariotte, and Malpighi. It has met, however, with fome confiderable oppofers, particularly the excellent M. Dodart, who could never be reconciled to it.

One of the great arguments for it is, that the fame experiments of ligature and incifion, which evince a circulation of the blood in animals, fucceed in the like manner in plants, particularly in fuch as abound with a milky fap, as the great tithymale, milk-thiftle, &c. if the ligature be faftened tight round them, the part above is found to fwell very confiderably, and that below it, a little: whence it appears, that there is a juice afcending from the branches; and that the latter is thicker than the former, which quadrates exactly with the common fyftem; the juice being fuppofed to arife in capillary veffels, in form of a fubtile vapour, which, condenfed in the extremes of the plant, by the neighbourhood of the cold air, turns back in form of a liquor, through the more patent pipes of the inner bark.

M. Dodart, inftead of the fame juices going and returning, contends for two feveral juices; the one imbibed from the foil digefted in the root, and from thence tranfmitted to the extremes of the branches, for the nourifhing of the plant; the other received from the moifture of the air entering in at the extremities of the branches: fo that the afcending and defcending juices are not the fame.

One of his chief arguments is, that if two trees of the fame kind be tranfplanted in one day, after firft cutting off their roots and branches, and if, after they have taken root again, fome of the new fhoots put forth each year be cut off one of them, it will not thrive half fo well, notwithftanding its root and trunk being intire as the other.

This he conceives to be a proof of the plants deriving nourifhment by the branches, and concludes it to be of an aerial nature, becaufe formed of the moifture of the air, dew, &c. whereas that imbibed from foil is terreftrial, &c. *Hift. de l'Acad. Roy. Ann.* 1709.

The humour or fap of a plant, then, is a juice furnifhed by the earth, and changed into the plant, confifting of fome foffil parts, other parts derived from the air and rain, and others from putrified animals, plants, &c. Confequently, in vegetables, are contained all kinds of falts, oil, water, earth, &c. and, probably, all kinds of metals too, inafmuch as the afhes of vegetables always yield fomewhat which the loadftone attracts.

This juice enters the plant in form of a fine and fubtile water; which the nearer it is to the root, the more it retains of its proper nature; and, the farther from the root, the more action it has fuftained, and the nearer it approaches to the nature of the vegetable.

Confequently, when the juice enters the root, the bark whereof is furnifhed with excretory veffels, fitted to difcharge the excrementitious part, it is earthy, watery, poor, acid, and fcarce oleaginous at all.

In the trunk and branches it is further prepared, though it ftill continues acid; as we fee by tapping or perforating of a tree in the month of February, when it diftils a watery juice apparently acid.

The juice being here carried to the germs or buds is more concocted; and here, having unfolded the leaves, thefe come to ferve as lungs for the circulation and further preparation of the juice.

For thefe tender leaves, being expofed to the alternate action of heat and cold, moift nights, and hot fcorching days, are alternately expanded and contracted, and the more on account of their reticular texture.

By fuch means is the juice ftill further altered and digefted, as it is further in the petala or leaves of the flowers which tranfmit the juice, now brought to a further fubtility, to the ftamina: thefe communicate it to the farina or duft in the apices, which is, as it were, the male feed of the plant, where having undergone a further maturation, it is fhed into the piftil, which performs the office of an uterus or womb; and thus, having acquired its laft perfection, it gives rife to a new fruit or plant.

The root or part whereby vegetables are connected to their matrix, and by which they receive their nutritious juice, confifts of an infinite number of vafa abforbentia, which, being difperfed through the interftices of the earth, attract or imbibe the juices of the fame: confequently, every thing in the earth that is diffoluble in water, is liable to be imbibed; as air, falt, oil, fumes of minerals, metal, &c. and of thefe do plants really confift.

Thefe juices are drawn from the earth very crude; but by the ftructure and fabric of the plant, and the various veffels they are ftrained through, become changed, further elaborated, fecreted, and affimilated to the fubftance of the plant.

The motion of the nutritious juices of vegetables is produced, much like that of the blood in animals, by the action of the air; in effect, there is fomething equivalent to refpiration throughout the whole plant.

The difcovery of this is owing to the admirable Malpighi, who firft obferved, that vegetables confift of two feries or orders of veffels.

Firft, fuch as receive and convey the alimental juices, anfwering to the lacteals, veins, &c. of animals.

Secondly, tracheæ or air veffels, which are long hollow pipes, wherein air is continually received and expelled, i. e. infpired and expired; within which tracheæ he fhews all the former feries of veffels are contained.

Hence, it follows, that the heat of a year, nay, of a day, of a fingle hour, or minute, muft have an effect on the air included in thefe tracheæ, i. e. muft rarefy it, and confequently dilate the tracheæ; whence arifes a perpetual fpring or fource of action, to promote the circulation in plants.

For, by the expanfion of the tracheæ, the veffels containing the juices are preffed, and by that means the juice contained is continually propelled, and fo accelerated; by which propulfion, the juice is continually comminuted, and rendered more and more fubtile, and fo enabled to enter veffels ftill finer and finer, the thickeft part of it being at the fame time fecreted, and depofited into the lateral cells or loculi of the bark, to defend the plant from cold, and other external injuries.

The juice having thus gone its ftage, from the root to the remote branches, and even the flower; and having in every part of its progrefs depofited fomething both for aliment and defence; what is redundant paffes out into the bark, the veffels whereof are inofculated with thofe wherein the fap mounted; and through thefe it re-defcends to the root, and thence to the earth again: and thus a circulation is effected.

Thus is every vegetable acted on by heat and cold, during the day-time efpecially, while the fun's force is confiderable, the fap-veffels fqueezed and preffed, and the fap protruded and raifed, and at length evacuated, and the veffels exhaufted; and, in the night again, the fame tracheæ being contracted by the cold of the air, the other veffels are eafed and relaxed, and fo difpofed to receive frefh food for the next day's digeftion and excretion.

What courfe the juice takes, after it is imbibed by the roots, is not very clear; the veffels that take it up, to convey it to the plant, are too fine to be traced; and hence it has been controverted, whether it is by the bark, or the pith, or the woody part, that the plant is fed.

The more common opinion is for the bark: the juice, raifed by the capillaries of the wood, is here fuppofed to defcend by the larger fibres, placed in the inmoft part thereof, immediately over the wood; in which defcent, the fap, now fufficiently prepared, adds a part of its fubftance to the contiguous wood, and thus increafes by appofition: and hence it may be, that hollow, carious, or rotten trees, which have neither pith nor wood, except juft enough to fuftain the bark, do grow and bear. Some contend for the wood, which they obferve to confift of flender capillary tubes running parallel to each other from the root up to the trunk, being proper to receive in a fine vapour; in the afcent whereof the fibres become opened, and their fubftance increafed; and thus the trunks of trees are faid to increafe in their circumference.

As for the pith; as the woody ſubſtance of the trunk becomes more woody, the pith is compreſſed and ſtreightened to ſuch a degree that in ſome trees it quite diſappears: whence it ſeems, that its office in vegetation is not very important, ſince ts uſe is not perpetual. By its ſpongious ſubſtance, it ſhould ſeem fitted to receive any ſuperfluous moiſture tranſuding through the pores of the woody fibres: and, if by the exceſs of ſuch moiſture, or the like cauſe, it corrupt and rot, as it frequently happens in elms, the tree does not grow the worſe for it; which is a convincing proof it is of no great uſe.

The learned Dr. Boerhaave diſtributes the juices of plants into ſix claſſes.

Firſt, the firſt claſs comprehends the crude nutritious juice, or the juices of the root and ſtem of plants, which are little more than the mere matter of the element, as drawn by the root from the body it adheres to, whether it be earth, water, or the like.

This juice is found in every part of the plant, and therefore may be held an univerſal juice; yet he conſiders it as the juice of the root and ſtem, becauſe it is chiefly found in them.

This he takes to be a ſubacid watery lymph, without any ſpecific taſte or ſmell, as not being yet arrived to the maturity of oilineſs.

To this claſs belong thoſe juices which diſtil in great abundance from wounds or inciſions made in the woody parts of plants; ſuch, for inſtance, is that tart liquor ouſing from the root of the walnut-tree, when cut off in the month of May.

Such alſo is that limpid, ſubacid humour, flowing out very plentifully at an inciſion in the birch-tree in the month of March, to the quantity of ſeveral gallons in a few days.

Such alſo is the juice iſſuing out of the vine wounded in the ſpring-time, which always taſtes tartiſh, and ferments like the grapes themſelves.

This juice may be eſteemed as yet foſſil, being generated of and in the earth; for the juice of the earth, being received into the canals of this plant, retains its nature during two or three circulations; nor does immediately commence a vegetable juice.

This claſs of juices therefore he accounts as the chyle of the plant, being chiefly found in the firſt order of veſſels, viz. in the roots and the body of the plant, which anſwers to the ſtomach and inteſtines of animals.

Secondly, the ſecond claſs of the juices is that of the leaves, which are the real lungs of plants, and accordingly make a further change of the juice, which they receive from the roots and ſtem by force of the air. The juice of leaves is different therefore from the firſt juice, as being more ſulphureous, and farther elaborated; not that it derives any ſulphur from the ſun, but that, its watery part exhaling, it becomes more oily, and leſs volatile.

The juice of leaves he diſtinguiſhes into three kinds:

The firſt is the nutritious juice of the leaves; which is that already deſcribed, only further elaborated in the minute veſiculæ of the leaves, and conſequently leſs watery, and more oily and ſaccharine.

The ſecond is wax, which, exuding out of the leaves, adheres to the ſurface, and is ſcraped off by bees with their rough thighs, to build their combs withal. This is chiefly afforded by lavender and roſemary: upon the latter of which, the wax may be plainly perceived ſticking to the leaves of it.

The third is manna: not that with which the Iſraelites were fed in the deſart, but a drug ſold among us: it is an eſſential ſaccharine ſalt, exuding chiefly by night, and, in the ſummer-ſeaſon, from the leaves of a ſort of aſh growing in Calabria and Sicily, and adhering thereto in the form of a cruſt, to be gathered the next morning before the ſun is up.

The like ſubſtance is found to exude from the leaves of the linden-tree and poplar, in the heats of May and June; at which time they have an honey-taſte, and are even ſeen with a fatty juice on them, which, at the approach of the cold evening, gathers into grains.

Thirdly, the third claſs of juices are thoſe of flowers, or the genital parts of plants; in theſe are:

Firſt, a pure, elaborated, volatile oil or ſpirit, wherein the particular ſmell of the plant or flower reſides, and which, by reaſon of its extreme volatility, exhales ſpontaneouſly; inſomuch that, if the flower be laid for ſome time in a warm place, the odorous juice or ſpirit will be all fled.

The ſecond is the juice expreſſed from the flower, which in reality is the ſame with that of the root and leaves, only farther prepared; it is thicker than the former, and has ſcarce any ſmell at all: thus, if you bruiſe an hyacinth, or other fragrant flower, and expreſs the juice, it will be found altogether inodorous.

The third is the ſweet juice called honey, which exudes from all flowers; aloes, colocynthis, and other bitter flowers, not excepted.

In all male flowers, that have utricles at the bottom of the petala, which Dr. Linnæus ſtiles the nectarium, is found a viſcid, ruddy, ſweet juice in ſome plenty; and accordingly we ſee the children gather cowſlips, fox-gloves, honeyſuckles, &c. and ſuck the honey from them: the bees too viſit theſe flowers, and, putting in their proboſcides or trunks, ſuck out the honey, and load their ſtomachs therewith, to be afterwards diſcharged and laid up in their combs: ſo that honey is a vegetable juice.

Fourthly, the fourth claſs of juices are thoſe of the fruit and ſeed; the preparative whereof is nature's final work: which performed, the plants ſeem to die for a time, as all animals are ſeen to languiſh after the emiſſion of their ſemen.

The juice of the fruit is like that of the root, only farther elaborated.

The juice of the ſeed is an eſſential oil or balm, elaborated and exalted to its laſt perfection. This juice or oil is not found in the very point or embryo in the center of the placenta; all we meet with in that part, is a few fine watery particles ſecreted from the placenta: but it is in the placentula or cotyledons themſelves, which conſiſt of innumerable little folliculi or cells, wherein this only juice is contained, ſerving to defend the embryo, and preſerve it from being corrupted by water, which, it is well known, will hardly paſs through oil.

Thus, if you take, for inſtance, fennel-ſeed, cut it through the middle, and apply it to the microſcope, you will eaſily perceive a clear ſhining oil in the cells of each lobe, inveſting the tender embryo. Without this oil, it were impoſſible a ſeed ſhould live a month, and, much leſs, a year or two, intire and uncorrupted in the ground.

This oil is found in the ſeeds of all plants; in ſome, for inſtance, in almonds, cocoa-nuts, &c. in very great quantities; in others leſs, as pepper, arum, &c. where one would ſcarce imagine any oil at all: and theſe ſeeds loſe their vegetative quality very ſoon.

Fifthly, the fifth claſs of juices are thoſe of the bark; which is an artful congeries or bundle of perſpirative ducts, and abſorbent veſſels.

Of theſe juices there are divers ſpecies; for the ſeveral humours raiſed and diſtributed through the leaves, flowers, and other parts of the plants, have all circulated through the bark, and accordingly are frequently found to diſtil from wounds made therein. In ſome caſes, even the whole plant is no more than bark, the pulp having been eaten out; as in willows, poplars, &c. which will live a long time in that ſtate.

The bark ſerves divers purpoſes; for it not only tranſmits the nutritious juices of the plants, but alſo contains divers fat oily humours, to defend the fleſhy parts from the injuries of the weather.

Sixthly, as animals are furniſhed with a panniculus adipoſus, uſually replete with fat, which inveſts and covers all the fleſhy parts, and ſcreens them from external cold; ſo are plants incompaſſed with a bark replete with fat juices, by the means whereof the cold is kept out, and in winter-time the ſpiculæ of ice prevented from fixing and freezing the juices in their veſſels; whence it is that ſome ſorts of trees remain ever-green the year round, by reaſon their barks have more oil than can be ſpent and exhaled by the ſun; and their leaves are covered with a thick oily film over their ſurface, which prevents their perſpiring, ſo much as other plants, and alſo defends them from the cold, &c.

All the juices of barks are reducible to eight, viz.

Firſt, the crude, acid, watery juice, called the chyle of the plant.

Secondly, an oily juice, which, burfting the bark in the beginning of the fummer, exudes out of feveral plants; as cyprefs, pine, fir, favin, juniper, and other ever-greens; and fuch alone: this oil diffolves by the fmalleft degree of warmth, and is eafily inflamed, and is that which defends the plant; which is the reafon why moft of thefe plants will not thrive in very hot climates.

For balm, or fatty liquor, more glutinous than oil, is nothing but the laft-mentioned oily juice, which was more fluid during the fpring-time; but which, by the greater heat of the fun, has evaporated all its moft fubtile parts, and is converted into a denfer liquor. Thus the finer part of oil of olives being exhaled by the fummer's warmth, there remains a thick balfam behind: thus alfo oil of turpentine, having loft its more liquid parts by heat, becomes of the thick confiftence of a balm.

Thirdly, a pitchy juice, which is the body of the oil itfelf, infpiffates, and turns black, when put into a great warmth: this is the moft obferved in the pine and fir.

Fourthly, refin, which is an oil fo far infpiffated, as to become friable in the cold, and may be procured from any oil, by boiling it much and long. Thus, if turpentine be fet over a gentle fire, it firft diffolves, and becomes an oil, then a balfam, then pitch, and then a refin; in which ftate it is friable in the cold, fufible by fire, and withal inflammable and combuftible; diffoluble in fpirit of wine, but not in water, which makes the character of refin.

Hence the oil is moft abundant in the barks in the winter-time, the balfams in fummer, and the refin in autumn.

Fifthly, colophony, which is a refin ftill farther exhaufted of its volatile part, being pellucid, friable, and approaching to the nature of glafs.

Sixthly, gum, which is an humour exuding out of the bark, and, by the warmth of the fun, concocted, infpiffated, and rendered tenacious, but ftill diffoluble in water and at the fame time inflammable, and fcarce capable of being pulverifed. This oily mucilage ferves as a pigment to cover over, and defend the buds of trees, from the injuries of wet and froft in winter; but will melt with a moift warmth, and eafily run from them, when the gentle warmth of the fpring approaches: nor is ever fo far hardened into a cruft, as to do any injury to the inclofed fhoot. This oily fubftance always contains in it an acid fpirit; which is a prefervative againft putrefaction.

Seventhly, a gummous refin; which is an humour fecreted in the bark, and dried by the heat of the fun; and thus conftituting a body that is partly gummous, and, as fuch, tenacious, and foluble in water; and partly refinous, and therefore friable, and foluble in oil, or fpirit of wine, but not in water.

Botanifts are now generally agreed, that all plants are furnifhed with organs and parts neceffary both for chylification and fanguification; that they have veins, arteries, heart, lungs, adipofe, cellules, &c. If fo, it is obvious, that there muft be fome difference between the juices, which have not undergone the action of thofe parts, and fuch as have already circulated a number of times.

The feveral juices, hitherto recounted, are the firft or nutritious juice, called alfo the chyle of the plant, under fuch alterations, and new modifications, as it undergoes in being received, and kept fome time, in parts of a peculiar ftructure; as leaves, flowers, feed, &c. This laft juice, called the blood, is the fame nutritious juice farther altered, by being divers times paffed through each of thofe parts, and remixed, and at length converted into a new juice, with properties different from any of them all.

To prove the circulation of the fap, inftances are brought from experiments made by Mr. Fairchild; as, his budding or inoculating of a paffion-tree, whofe leaves are fpotted with yellow, into one of that fort of paffion-tree whofe leaves are plain: for though, the buds did not take, yet, after it had been budded a fortnight, the yellow fpots began to fhew themfelves about three feet above the inoculation; and, in a little time after that, the yellow fpots appeared on a fhoot, which came out of the ground from another part of the plant; which has been accounted a plain proof of the fap's circulation.

Another inftance is, a fecond experiment of the fame perfon, who grafted the ever-green oak, or ilex, upon the common oak. The leaves of the common oak, which was the ftock, decayed, and fell off, at the ufual feafon of the year; but the ever-green oak, which was the cyon grafted upon it, held its leaves, and continued fhooting in the winter. From whence it is concluded, that, when trees drop their leaves, the fap keeps full in motion, and is not gone into the root, as fome perfons think.

There are alfo other experiments of the fame perfon, which were fhewn before the Royal Society; as the New-England cedar, or rather juniper, grafted on the Virginian: and what is taken to prove the circulation in it, is, the branch which was grafted was left feveral inches below the grafting; which continued growing as well as the upper-part above the grafting.

And alfo another, which is the viburnum, with the top planted in the ground, which was become roots; and the roots turned up, which were become branches: which plant was in as good a ftate of growing, as it was in its natural ftate.

A third experiment of his was on a pear-tree, which he inarched upon two pear-ftocks, in March 1721-2, having the roots out of the ground; and was in a good flourifhing ftate, with a branch in bloffom, that receives no other nourifhment but by the juices that return down the other two branches; which, though it had been done above two years, yet it continued fhooting fuckers out of the root; which is efteemed as a proof, that the branches are as ufeful to fupport the roots, as the roots the branches: and thence he infers, that it is not ftrange, that fo many trees mifcarry in planting, when there are no branches left to the head to maintain the circulation to the roots.

A fourth experiment he made on the cedar of Lebanon, grafted on the larix, which dropped its leaves in the winter, yet maintained the cedar in a flourifhing condition, as if it had been on a tree which held its leaves all the winter; and the circulation of juices fupported the graft below the grafting, and kept it in as good health as above the grafting.

In oppofition to the notion of the circulation of the fap in trees like to that in animal bodies, the Rev. Dr. Hales, in his excellent treatife on Vegetable Statics, prefents us with various experiments, and fays:

When the fap has firft paffed through that thick and fine ftrainer, the bark of the root, we then find it in greateft quantities in the moft lax part, between the bark and wood, and that the fame through the whole tree.

And if, early in the fpring, the oak, and feveral other trees, were to be examined near the top and bottom, when the fap firft begins to move, fo as to make the bark run, and eafily peel off, he believes it would be found, that the low bark is firft moiftened; whereas the bark of the top branches ought firft to be moiftened, if the fap defcends by the bark. As to the vine, he fays, he is pretty well affured, that the lower bark is firft moiftened.

He adds, that it is to be feen in many of the examples of the experiments he has given in that book, what quantities of moifture trees daily imbibe and perfpire: now the celerity of the fap muft be very great, if that quantity of moifture muft moft of it afcend to the top of the tree, then defcend, and afcend again, before it is carried off by perfpiration.

The defect of a circulation in vegetables feems, in fome meafure, to be fupplied by the much greater quantity of liquor, which the vegetable takes in, than the animal, whereby its motion is accelerated: for, by the firft example he gives, we find the funflower, bulk for bulk, imbibes and perfpires feventeen times more frefh liquor than a man every twenty-four hours.

Befides, nature's great aim in vegetables being only, that the vegetable life be carried on and maintained, there was no occafion to give its fap the rapid motion which was neceffary for the blood of animals.

In animals, it is the heart which fets the blood in motion, and makes it continually circulate: but in vegetables we can difcover no other caufe of the fap's motion, but the ftrong attraction of the capillary fap-veffels, affifted by the brifk undulation and vibration caufed by the fun's warmth; whereby the fap is carried up to the top of the talleft trees, and is there perfpired off through the leaves: but, when the furface of the tree is greatly diminifhed by the

the loſs of its leaves, then alſo the perſpiration and motion of the ſap are proportionably diminiſhed; as is plain from many of his experiments.

So that the aſcending velocity of the ſap is principally accelerated by the plentiful perſpiration of the leaves, thereby making room for the fine capillary veſſels to exert their vaſtly attracting power; which perſpiration is effected by the briſk rarefying vibrations of warmth; a power that does not ſeem to be any-ways well adapted to make the ſap deſcend from the tops of vegetables, by different veſſels, to the root.

If the ſap circulated, it muſt needs have been ſeen deſcending from the upper part of large gaſhes, cut in branches ſet in water, and with columns of water preſſing on their bottoms in long glaſs tubes, in his forty-third and forty-fourth experiments. In both which caſes it is certain, that great quantities of water paſſed through the ſtem; ſo that it muſt needs have been ſeen deſcending, if the return of the ſap downwards were by truſion or pulſion, whereby the blood in animals is returned through the veins to the heart; and that pulſion, if there were any, muſt neceſſarily be exerted with prodigious force, to be able to drive the ſap through the finer capillaries.

So that, if there be a return of the ſap downwards, it muſt be by attraction, and that a very powerful one, as may be ſeen by many of theſe experiments, and particularly by experiment the eleventh. But it is hard to conceive what and where that power is, which can be equivalent to that proviſion nature has made for the aſcent of the ſap, in conſequence of the great perſpiration of the leaves.

The inſtances of the jaſmine-tree, and of the paſſion-tree, have been looked upon as proofs of the circulation of the ſap; becauſe their branches which were far below the inoculated bud, were gilded. But we have many viſible proofs in the vine, and other bleeding trees, of the ſap's receding back, and puſhing forwards alternately, at different times of the day and night; and there is great reaſon to think, that the ſap of all other trees has ſuch an alternate receding and progreſſive motion, occaſioned by the alternacies of day and night, warm and cold, moiſt and dry.

For the ſap in all vegetables does probably recede, in ſome meaſure, from the tops of branches, as the ſun leaves them; becauſe, its rarefying power then ceaſing, the greatly rarefied ſap and air mixed with it will condenſe, and take up leſs room than they did, and the dew and rain will then be ſtrongly imbibed by the leaves, as is probable from the forty-ſecond experiment, and ſeveral others; whereby the body and branches of the vegetable, which have been much exhauſted by the great evaporation of the day, may, at night, imbibe ſap and dew from the leaves.

For, by ſeveral experiments in the firſt chapter of the book of Vegetable Statics, plants were found to increaſe conſiderably in weight in dewy and moiſt nights.

And by other experiments on the vine, in the third chapter, it was found, that the trunk and branches of vines were always in an imbibing ſtate, cauſed by the great perſpiration of the leaves, except in the bleeding ſeaſon; but, when at night the perſpiring power ceaſes, then the contrary imbibing power will prevail, and draw the ſap and dew from the leaves, as well as moiſture from the roots.

And we have a further proof of this in the twelfth experiment, where, by fixing mercurial gauges to the ſtems of ſeveral trees which do not bleed, it is found that they are always in a ſtrongly imbibing ſtate, by drawing up the mercury ſeveral inches; whence it is eaſy to conceive, how ſome of the particles of the gilded bud in the inoculated jaſmine may be abſorbed by it, and thereby communicate their gilding miaſma to the ſap of the other branches; eſpecially when, ſome months after the inoculation, the ſtock of the inoculated jaſmine is cut off a little above the bud, whereby the ſtock, which was the counter-acting part to the ſtem, being taken away, the ſtem attracts more vigorouſly from the bud.

Another argument for the circulation of the ſap is, that ſome ſorts of grafts will infect and canker the ſtocks they are grafted on; but by the twelfth and thirty-ſeventh experiments, where mercurial gauges were fixed to freſh-cut ſtems of trees, it is evident, that thoſe ſtems were in a ſtrongly imbibing ſtate; and, conſequently, the cankered ſtock might very likely draw ſap from the graft, as well as the graft alternately from the ſtock; juſt in the ſame manner as leaves and branches do from each other in the viciſſitudes of day and night.

And this imbibing power of the ſtock is ſo great, where only ſome of the branches of the ſtock will, by their ſtrong attraction, ſtarve thoſe grafts; for which reaſon, it is uſual to cut off the greateſt part of the branches of the ſtock, leaving only a few ſmall ones to draw up the ſap.

The inſtance of the ilex grafted upon the Engliſh oak ſeems to afford a very conſiderable argument againſt a circulation, for, if there were a free uniform circulation of the ſap through the oak and ilex, why ſhould the leaves of the oak fall in winter, and not thoſe of the ilex?

Another argument againſt an uniform circulation of the ſap in trees, as in animals, may be drawn from Dr. Hales's thirty-ſeventh experiment; viz. where it was found, by three mercurial gauges, fixed to the ſame vine, that, while ſome of its branches changes their ſtate of protruding ſap into a ſtate of imbibing, others continued protruding ſap, one nine, and the other thirteen days longer.

That the ſap does not deſcend between the bark and the wood, as the favourers of a circulation ſuppoſe, ſeems evident from hence, viz. that, if the bark be taken off for three or four inches breadth quite round, the bleeding of the tree above that bared place will much abate; which ought to have the contrary effect, by intercepting the courſe of the refluent ſap, if the ſap deſcended by the bark.

But the reaſon of the abatement of the bleeding, in this caſe, may be well accounted for, from the manifeſt proof we have in theſe experiments, that the ſap is ſtrongly attracted upwards by the various operation of the perſpiring leaves and attracting capillaries; but, when the bark is cut off for ſome breadth below the bleeding place, then the ſap which is between the bark and the wood below that diſbarked place is deprived of the ſtrong attracting power of the leaves, &c. and conſequently the bleeding wound cannot be ſupplied ſo faſt with ſap, as it was before the bark was taken off.

But the moſt conſiderable objection againſt this progreſſive motion of the ſap, without a circulation, ariſes from hence, viz. that it is too precipitate a courſe for a due digeſtion of the ſap, in order to nutrition: whereas in animals nature has provided that many parts of the blood ſhall run a long courſe before they are either applied to nutrition, or diſcharged from the animal.

But when we conſider that the great work of nutrition in vegetables, as well as animals (we mean after the nutriment is got into the veins and arteries of animals) is chiefly carried on in the fine capillary veſſels, where nature ſelects and combines, as ſhall beſt ſuit her different purpoſes, the ſeveral mutually attracting nutritious particles, which were hitherto kept disjoined by the motion of their fluid vehicle; we ſhall find, that nature has made an abundant proviſion for this work in the ſtructure of vegetables: all whoſe compoſition is made up of nothing elſe but innumerable fine capillary veſſels, and glandulous portions or veſicles.

Upon the whole, he thinks we have, from theſe experiments and obſervations, ſufficient ground to believe, that there is no circulation of the ſap in vegetables; notwithſtanding many ingenious perſons have been induced to think there was, from ſeveral curious obſervations and experiments, which evidently prove, that the ſap does, in ſome meaſure, recede from the top, towards the lower part of plants; whence they were, with good probability of reaſon, induced to think, that the ſap circulated.

SAVORY, a plant much cultivated in the kitchen-garden, and is of two ſorts, viz. ſummer and winter ſavory, the uſes of both which are nearly the ſame.

The former is an annual plant, raiſed only from its ſeed, which ſhould be ſown in the beginning of April, in a bed of looſe and light earth. If the plants are not intended to be removed, their ſeeds ſhould be ſcattered thinly; but if they are to be tranſplanted, they may be ſown thicker. They muſt be kept clear from weeds, and are, in other respects, to be treated as before directed for marjoram.

Winter savory may be propagated from seeds sown at the same time as those of the summer sort; or by slips off its roots, for these are perennial, and will last several years: but as they do not put forth equally tender or well furnished shoots after they are grown old, the best way is to raise a supply of young plants every other year. The slips of the winter savory will soon take root and flourish; and they, as well as the plants of this species raised from seed, will endure the greatest cold of our winters, and have the most aromatic smell and taste, when they are planted in a poor and dry soil. Wet ground is very apt to render them mouldy, and consequently make them rot. Mr. Miller has noticed some of these plants growing upon the top of an old wall, where they were fully exposed to the cold, and they there survived such severe frost as killed most of those of the same kind that were planted in the ground.

The winter savory flowers in June, and the summer savory in July; but the seed of both ripen in the autumn, and at no great distance of time from each other.

SCAB, a disease incident to sheep, chiefly occasioned by a tedious length of wet weather

"I imagine, says Mr. Vesey, your readers will not be displeased if I should, with your assistance, communicate to them a remedy for this disorder, which I have several times tried, and almost always found to answer extremely well.

"Some men, whom I have known to breed and feed a great number of sheep, have been grossly mistaken in their comprehension of the nature of this distemper, which they rashly judged to be merely cutaneous; whereas, when a sheep has the scab, the blood is always more or less affected by it: therefore the outward applications, which are in general alone resorted to for a cure, do for the most part more hurt than good, by driving in the eruption, and making it fix on the internals, thereby often occasioning the death of the animal.

"Now the true way to treat this disorder is, first to give the animal something inwardly to drive out the eruption; then comes, with propriety, the outward application, which completes the cure by killing the scab.

"When a farmer has any of his flock afflicted with the scab, let him attend to the directions which follow.

"Take a gallon of soft well or pond water, which divide into two equal parts: in one of these parts dissolve eight ounces of old hard soap; to which, when it is dissolved, add two ounces of spirits of hartshorn, and seven ounces of common salt, with four ounces of roll brimstone, beat to a fine powder and sifted: then take the other part of the water, in which put two ounces of tobacco leaf, and one of white hellebore root: boil this second part till you have a strong infusion, after which strain it clear from the leaves and roots.

"When you have got thus far in the process, take that part of the water, first mentioned, and set it over the fire; let it boil for about half an hour, keeping it continually stirring with a wooden ladle during that time: in the mean time heat again the other part, in which the tobacco and hellebore were infused; and when it is hot, mix the two parts gradually together over the fire, keeping the mixture continually stirring till it is taken off the fire, which should be in about a quarter of an hour: when it is quite cold, let it be put into a stone bottle, in order to its being kept in a cool place for use.

"Then take four quarts of new ale or beer: put into it twelve ounces of common salt, two ounces of bay salt, and eight ounces of pounded nitre, together with twelve ounces of pounded roll brimstone: set them over a gentle fire, and when the ale boils, take off the scum; let it boil for about half an hour; after which set it by till it is cold, and put it into a stone bottle for use.

"When you are so far prepared, take one quart of ale, set it on the fire; mix into it by degrees, three ounces of flour of brimstone; when it is just ready to boil take it off the fire, and let it stand to cool; and when it is only blood-warm, give this quantity inwardly to three sheep, which is to be repeated every second day till they have had three doses. This will drive out the disorder, when the first mixture is to be rubbed on the distempered parts: and two days afterwards the second, and so alternately for about eight or ten days, till the cure is effected: sometimes two rubbings will be sufficient.

"I must observe, that all these mixtures will be best boiled in well-glazed earthen or iron pots." *Museum Rusticum, vol.* II. *pag.* 173.

"The two greatest enemies the sheep, says another ingenious gentleman, or at least their wool (which is the most valuable part of them) have, are the scab and fly. I believe they destroy more wool than all the other diseases incident to that animal.

"Mr. Vesey has given us an approved remedy for the scab, and at the same time enters somewhat into the nature of that distemper. For my own part, I have not presumption enough to look into first causes; secondary ones are all I aim at: I always took nature to be a wise instructor, and the surest guide; but if we will hobble out of the way ourselves, she is not to blame.

"I agree with Mr. Vesey, that in this, and every other distemper a sheep labours under, the blood is more or less affected and disturbed; which disturbance, if I am not mistaken, the faculty call a fever; therefore it must be always considered, that a fever is no more than a struggle of nature to get rid of some enemy in the blood, by throwing it out by some of the outlets of the body, namely, by sweat, urine, or stool; or upon the surface of the skin; and then she seems to say, I have thrown the distemper out to your view, and there destroy it by proper applications.

"It surely is not scab until it is thrown out upon the skin; and when it is thrown out, what avails it giving internal remedies, to do that which nature has done before? If it be out, there's your ailment; and I think, gentlemen, it is an axiom in physic, that when a distemper is once known, it is half cured: if it is only coming out, my advice would be, not to disturb nature, who is always acting for our good, in a wiser and better manner than we can do ourselves: she sometimes indeed is too weak for her office, and sometimes too strong; in the one case she is to be properly assisted, and in the other, prudently restrained; and when we do more or less, the effects are generally fatal. I hope this will satisfy Mr. Vesey, that he is not altogether in the right, any more than his neighbours.

"To cure an illness with a few medicines, is as commendable, as to say a great deal in a few words. One great obstacle to Mr. Vesey's treatment of sheep with scab, is its being too compound, troublesome, and laborious, setting aside the expence, and, where there are a great number of sheep, hardly to be practised. I would have all remedies for the ailments of sheep be as simple as possible; and to be obtained and prepared with as little trouble; for certain I am, gentlemen, when it is otherwise, many will let their flocks go neglected, or at best leave them to a slovenly shepherd, who knows very little of the matter; and when clip-day comes, when the poor creatures are out of their wool, (if they had any on before) what a sight presents itself to view! most parts of their skins being one continued scab, and other parts eat quite through, and deep into the flesh, by the maggot: this I have seen at clip-day, and may speak it; but what must I alledge it was owing to? Sorry am I to say, to the over credulity of the master, who thought he had a shepherd who knew every thing; but the event proved the contrary.

"You must not be surprised when I say, what will destroy the fly, will also cure the scab, with little or no alterations: mercury is a mortal foe to both; and the remedy for the fly is as follows.

"Take of good corrosive sublimate, half an ounce; dissolve it in two quarts of rain water; to which add a gill of spirits of turpentine: this is the whole of it, which must be used in the following manner.

"When the sheep is struck, the shepherd must make a circle round the maggots with some of the water, by dropping it out of a bottle: this prevents them getting away, for they will not come near the water: then he must shred or open the wool within the circle, and drop a few drops of the water amongst them, and rub them about with his finger, and there leave them, for they will all die presently.

"I ſpeak this from my own certain knowledge, and many others in this part of the country (Iſle of Ely) can do the ſame.

"To a quart of the above water I add a pint of the ſimple lime-water of the London diſpenſatory; and I declare it from experience, there is no more certain cure for the ſcab than it: I am ſure it is the cleaneſt, the ſooneſt prepared, and, when ſo, the cheapeſt; which are inducements, I think, ſufficient to have every countryman make uſe of it." *Muſeum Ruſticum, vol.* II. *pag.* 369.

SCABIOUS, the name of a flowering ſhrub cultivated in moſt pleaſure gardens.

All the ſhrubby ſorts of ſcabious may be propagated by cuttings, which may be taken off during any of the ſummer-months, and ſhould be planted in a ſhady border, and duly watered in dry weather, which will promote their taking root; and then they may be potted, and placed in a ſhady ſituation, till they have taken new root, after which time they may be placed amongſt other hardy exotic plants, in a ſheltered ſituation, where they may remain until the end of October, when they muſt be moved into ſhelter. In ſome favourable ſeaſons theſe plants will produce good ſeeds in England, ſo that the plants may be raiſed from theſe, by ſowing them in an open border of light earth about the middle of March; and, if the ſpring ſhould prove very dry, it will be neceſſary to water the ground now-and-then, which will forward the vegetation of the ſeed; ſo that the plants will appear in about three weeks after the ſeeds are ſown. When they come up, they muſt be kept clear from weeds, and in dry weather duly watered; and, when they are ſtrong enough to tranſplant, they ſhould be planted in pots, and managed in the ſame manner as thoſe plants which are propagated by cuttings.

All the ſorts of ſcabious continue a long time in flower, for which they are regarded; for there is no very great beauty in many of their flowers: but, as moſt of the hardy ſorts produce flowers near three months ſucceſſively, ſo they may be allowed a place in the borders of large gardens, becauſe they require very little care to cultivate them. And as the ſhrubby kinds continue in flower moſt part of the year, ſo they make an agreeable variety amongſt hardy exotic plants in the winter. *Miller's Gard. Dict.*

SCALLIONS. *See the article* ESCALLIONS.

SCRATCHES, a diſtemper incident to the heels of horſes.

It has ſo much affinity with the greaſe, and is ſo often a concomitant of that diſeaſe, that the method of curing the ſcratches may be ſelected from that article.

The parts affected ſhould be firſt covered with the linſeed and turnep poultice, having a little common turpentine added to relax the veſſels; the green ointment may then be applied to promote the diſcharge, when the ſcratches may be dried up with the ointments and waſhes recommended in that article. *See* GREASE.

It is beſt afterwards to keep the heels ſupple, and ſoftened with curriers dubbing, which is made of oil and tallow. This will keep the hide from cracking, and be as good a preſervative as it is to leather; and by uſing it often before exerciſe, will prevent the ſcratches, if care is taken to waſh the heels with warm water, when the horſe comes in. When they prove obſtinate, and the ſores are deep, uſe the following; but if any cavities or hollow places are formed, they ſhould firſt be laid open, for no foundation can be laid for healing, till you can dreſs to the bottom.

> Take Venice turpentine four ounces, quickſilver one ounce; incorporate well together by rubbing ſome time, and then add honey and ſheeps ſuet, of each two ounces.

Anoint with this once or twice a day; and if the horſe is full or fleſhy, you muſt bleed and purge; and if the blood is in a bad ſtate, the alteratives muſt be given to rectify it. *Bartlet's Farriery, page* 294.

SCYTHE, SITHE, *or* SYTHE, the inſtrument uſed in mowing, being a crooked blade joined at right-angles to a long pole. *See the article* MOWING.

SEAGRIM. *See* RAGWORT.

SEAM, tallow, greaſe, hogs-lard.

SEAM *of Corn*, a quarter, or eight buſhels.

SEAM *of Wood*, a horſe load of wood.

SEAR, dry; oppoſed to green: ſpoken of wood.

SEARCHER. *See the article* BORER.

SEAVES, ruſhes.

SEAVY *Ground*, ground over-run with ruſhes.

SEED, the product of a plant, whereby the ſpecies is propagated.

The choice of the ſeed intended to be ſowed is an object of greater importance than many farmers ſeem to imagine. It is not ſufficient that the fineſt grains be choſen for this purpoſe, unleſs they are likewiſe very clean. Such wheat is not difficult to be had from land cultivated according to the principles of the new huſbandry; but we ſeldom find corn intirely free from ſeeds of weeds when it has been raiſed in the common way.

It is natural to ſuppoſe, that the grains of ſtinted and ſickly corn neceſſarily partake of the weakly diſpoſition of the plant which produced them, and that their productions cannot be ſo fine as thoſe which grow from the ſeeds of ſtrong and healthy plants. For this reaſon Mr. Tull adviſes to take the ſeed corn from a richer ſoil than that in which it is to be ſowed, and rather from ground in perfect tilth, than from land which has been leſs carefully cultivated. This ſeems to be very right (though the contrary opinion is almoſt generally received), becauſe more may reaſonably be expected from the productions of a fine good ſeed, which are full of vigour and well conditioned, than from a poor weak plant.

M. de Chateauvieux, who often ſowed with no other intention than merely to try, for the benefit of mankind, at what time, in what manner, and in what condition it is beſt to ſow wheat, found that this corn ſprouted pretty well even when ſowed ſo green that it had not yet loſt its milky quality; but thinks it much more adviſeable to ſow none but what is thoroughly ripe: becauſe the ſeed has then attained its full perfection, from whence we may moſt certainly expect the beſt and ſtrongeſt plants.

"The wheat, ſays he, which has been reaped in a warm dry year, ſeems to me fitter for ſowing, than that which has been gathered in a cold wet ſeaſon: for in ſuch a time as this laſt, all the productions of the earth are leſs good; their taſte is leſs ſavoury; and as that corn in particular in which there is moſt moiſture, is moſt difficult to keep, I infer from thence that the formation of its grain muſt be leſs perfect. I ſhould therefore prefer wheat a year old, provided the year it was gathered in was warm and dry, to that which may have juſt been gathered in too rainy a ſeaſon: for the ſame reaſon, I always chooſe for ſowing, wheat of the growth of my high grounds, rather than that which has been produced in flats. The benefit accruing from all this care, may, perhaps, not be extremely great; but at the ſame time it does not coſt any thing. Let us do in agriculture what is done in all manufactures, where the very ſmalleſt profits, the very leaſt ſavings, are not neglected. Thoſe ſmall articles, often repeated, make large ſums in the long run, and are a real gain.

"Another thing, of greater conſequence, firſt made known to me by chance, but ſince confirmed by repeated experiments, always attended with the ſame ſucceſs, I ſtrongly recommend as extremely ſerviceable to the firſt ſprouting of the ſeed. In my experimental ſowings, I commonly uſed wheat taken from the heap in the granary; and likewiſe, frequently, corn picked out of the ears the moment before I ſowed it. I counted exactly the grains of both ſorts, and ſuppoſe that few will think there could be any difference in their productions. Yet I found a conſiderable one. What was picked out of the ears always roſe extremely well; ſcarce a grain of it ever miſſed; whereas numbers of thoſe which were taken from the heap, never ſprouted at all. I did not perceive this difference at firſt; but at laſt it ſtruck me. I relate the fact as it is, without pretending to account for the cauſe of this difference, which would lead me into too long a digreſſion. The experiment itſelf may be of real uſe, by ſhewing us, that inſtead of threſhing the wheat intended for ſeed at any time, without diſtinction, it ought not to be threſhed till a very few days, at moſt two or three, before it is ſowed. A few hands will be able to ſupply the ſeeds-men with as much as they will want: nor will this method, which may be a means of ſaving ſomewhat in the ſeed, be attended with any extraordinary expence.

"Perhaps,

"Perhaps too this practice may be attended with a very valuable advantage. I have not indeed yet made the trials neceffary to fatisfy myfelf of what I imagine; but my defire to be of fervice to the public induces me to mention it, that the lovers of agriculture may reflect upon it, and try fuch experiments as will clear up my conjectures.

"Threfhing the feed only juft before it is fowed may poffibly, in fome meafure, or perhaps intirely, prevent the caufe of fmut in wheat. By this I mean, that the feed which has not been mixed with fmutty corn, or any way infected by its black powder, will be exempt from that diftemper. Not that I take black powder to be abfolutely the original caufe of this diftemper in corn; but I believe it is very capable of communicating it to grains which are found.

"That nothing may be neglected which can be of any fervice to the feed, great care ought to be taken in threfhing the corn, efpecially in the manner that bufinefs is commonly performed, with flails, upon the barn floor: for a great number of grains are frequently fo much bruifed thereby, that it is impoffible they fhould ever grow. If the wheat thus threfhed for feed is not thoroughly dry and hard, the mifchief is ftill greater; much more of it being then abfolutely crufhed by the flail.

"As fowing in drills requires lefs feed than is ufed in the common method, it will be the eafier to execute there an operation which might be too long and troublefome for fo great a quantity as is ufed in the old way. The method which I advife, and which I have practifed, is this. Let one or two beams, two feet and a half, or three feet thick, be laid a-crofs the barn floor: let the threfhers ftand on each fide of the beam, and take out of loofe fheafs of wheat, one of which fhould be placed behind every man, a handful at a time, and give it two or three ftrokes againft the beam. This will bring out a great deal of grain, which is to be referved for feed. The ears thus fhaken may be bundled up again, and afterwards threfhed out with the flail, for other ufes. This method is not fo tedious as fome may imagine: we are fure that not a grain is bruifed; and thofe are the moft perfect which drop out thus. I think I may compare this operation with what is done in the making of wine, where the firft running is always the higheft flavoured and beft.

Another excellent way to feparate the fulleft, and confequently heavieft grains, which are undoubtedly the fitteft for feed, from thofe which are of lefs value for that purpofe, and at the fame time to clear them from many feeds of weeds, is, to make a ftout man, with a broad wooden fhovel, throw the corn with all his force towards an oppofite corner of the barn, or rather of a large boarded hall, which generally is the fitteft for this work. All the light, fmall, fhrivelled grain, unfit for fowing, and the feeds of cockle, darnel, &c. not being fo heavy as the found folid corn, will fall fhort, and lie neareft to the man who throws them; while fuch as are large, plump, and weighty, out-flying all the reft, are feparated widely, and may eafily be gathered up. Experience will fhew the vaft advantages of fowing feed thus chofen.

The ufe of fteeps was introduced very early into hufbandry, not only as a means of preferving corn from feveral diftempers to which it is fubject, but alfo with a view to render the feed more fruitful. That fome of them have fometimes anfwered the former of thefe intentions is undeniable: but with regard to the latter, much ftronger and oftener repeated evidences than any that have yet been produced, are ftill wanted to confirm their boafted efficacy. I fhall however, give a concife account of fome of the moft famous of both kinds; with this previous obfervation, that even fuch of them as have not fucceeded in fome cafes, through caufes perhaps unknown to us, may poffibly do well in others, when tried with proper judgment, and attention. Experiments of this kind fhould by all means be continued on a double account; firft, to take off a prejudice which feems to gain ground, though it be not founded on any rational principle; and next, to be well affured whether thefe preparations do, or do not, produce any fenfible effect. Experiments feldom prove ufelefs to careful accurate obfervers. If they do not always anfwer the end propofed, they at leaft fometimes lead the way to other important difcoveries.

The Romans had their lees of oil, decoction of cyprefs leaves, juice of houfe-leek, &c. on which they have beftowed full as much commendation as they merit. Lord Bacon feems to have been the firft who paid any attention to this fubject in England: but he has only pointed out the path to others: nor do I know any author who has yet given us a fet of experiments with this view, long enough continued abfolutely to determine what effects fome kind of fteeps may have towards rendering grain more fruitful.

Van Helmont, and, fince him, the authors of the Maifons Ruftiques, have given many receipts for fteeps, which they vaunt exceedingly, as increafing the fruitfulnefs of the feed fteeped in them. But at the fame time that they recommend thefe receipts, they advife fowing the corn thinner than ufual; generally one third lefs; a circumftance which, alone, will add greatly to the crop, as very many experiments, and particularly all the good trials of the new hufbandry, have evidently demonftrated. That the comparifon may be juft, all circumftances fhould be alike, as to the goodnefs of the foil, the quantity and quality of the feed, &c.

M. Duhamel, to fatisfy himfelf whether any benefit does arife from the ufe of fteeps, by way of giving the feed a greater degree of fruitfulnefs, tried the following experiment. He infufed fome good wheat in a lye of dung, mixed with lixivial falts, nitre, and fal ammoniac, and fowed with this grain two beds in his kitchen garden, dug with a fpade. One of the beds was fowed very thick, and the other very thin. At the fame time he fowed two other beds, exactly like the former, with fome of the fame feed, not fteeped, one thick, and the other thin. At harveft time, the beds fowed with the fteeped feed were fo exactly like the others, that it was impoffible for the eye to diftinguifh between them.

A gentleman in his neighbourhood followed exactly the directions given in the Maifons Ruftiques, in the ufe of one of their boafted receipts, which is there faid to be of fuch efficacy, that the land need be plowed but once for wheat prepared with it. He did fo; and his crop was fcarce worth reaping.

On the other hand, M. Duhamel mentions his being informed by M. Peyrol, many years fecretary to the intendent of Auvergne, that he had made feveral experiments in imitation of thofe mentioned in the abbé de Vallemont's famous book. In the month of May 1755, he planted in his garden (an indifferent foil, in a hot expofition,) four fmall cabbages, which then had only four leaves. In September following, the fame cabbages were fix feet and a half in circumference. Some plants of red wheat, tranfplanted into a bed dug very fine in his garden, bore one hundred and thirty ears a piece, each of which contained from forty to eighty grains. Some plants of white wheat, tranfplanted at the fame time, produced one hundred and twenty ears, each of which had from thirty to forty grains. Two grains of red wheat, fowed in the fame bed, and not tranfplanted, produced each of them one hundred and forty ears, which contained fix thoufand grains. Five plants of red wheat, diftant from one another fix inches, did not branch fo well, being too clofe together: but each of them produced from forty to fifty ears, which contained from forty to fixty grains. Rye, which branches lefs than wheat, produced from thirty to thirty-five ears, each containing from fixty to feventy grains: and the barley of that country, which branches but little, produced however from fixty to eighty ftalks, though the feed of this laft had not been fteeped in any liquor before it was fowed.

The author of thefe experiments judicioufly obferves, that they muft be repeated and varied, before it can be made to appear that the extraordinary increafe is owing to the fteep.

This celebrated liquor of the abbé de Vallemont is made as follows.

Put into a tub, expofed to the fouth, one bufhel of horfe-dung, the fame quantity of cow-dung, half a bufhel of pigeon's-dung, as much fheep's-dung, as much afhes, three gallons of fmall pricked wine, two pounds of faltpetre, and as much water as will fufficiently dilute the whole, fo as to make it thin enough for ufe. Every time that

that any of this liquor is taken out to ſprinkle the plants, it is filled up again with water; and as it may be too ſtrong at firſt, it may be weakened accordingly.

It is eſſential to obſerve, that M. Peyrol added to this infuſion frequent digging; for the ground was dug five times between the plants of wheat: and he obſerved that each digging ſenſibly gave freſh vigour to the plants, which grew to the height of ſix feet.

M. Donat, another of M. Duhamel's judicious correſpondents, made trials of theſe mixtures, from the uſe of which ſo much is promiſed: but ſays he thinks them of no other ſervice, than to amuſe the curious, who do not regret expence. As the authors of them boaſt that all kinds of ſoils, whether good, bad, or indiffrent, well or ill plowed, reſted or not reſted, will produce ten times more than in the common way; this gentleman ſowed a large extent of ground, ſome good, ſome bad, ſome well, and ſome ill plowed, &c. He made the ſteep himſelf, was preſent when the ſeed was ſowed, and took care that no circumſtance was neglected. But notwithſtanding all his care, his crop was far from anſwering their promiſes. The good, well cultivated ſoil, produced fine wheat; but not extraordinary in point of quantity. The only advantage was in the ſaving of the ſeed. The poor ill cultivated land, and that which had not been reſted, produced very little grain: and the very bad ſoil, none at all. Theſe experiments convinced M. Donat, that the ſureſt means of obtaining good crops, is, to have the ground in good condition. This is the principle on which the new huſbandry is founded: nor indeed does it offer any thing marvelous, or contrary to the moſt ancient precepts of good huſbandry.

If there be in any of theſe ſteeps, or preparations, a more than common virtue, by which the grain infuſed in them is rendered more prolific than it would otherwiſe be, poſſibly ſome ſuch benefit may accrue from the following practice, which is recommended by the author of the New Syſtem of Agriculture.

"Take, ſays he, the corn which is intended for ſowing, and throw it, by a buſhel at a time, into a large veſſel full of water: let a man ſtir it with a ſtaff, as violently as he can, for a conſiderable while together, and then, giving it a little time to ſettle, ſkim off all that ſwims upon the ſurface: repeat this till no more riſes; then take out the corn which has ſunk to the bottom, and lay it by for ſeed; proceeding in the ſame manner till you have your intended quantity. After this, make a brine of bay-ſalt and rain-water, ſtrong enough to bear an egg. Steep the ſeed corn in this liquor during thirty hours; for leſs time will not have any effect: then take it out, ſpread it upon a ſmooth floor, ſtrew over it a good quantity of fine-ground powder of flaked lime, and ſweep the whole up and down till each grain leaves clinging to another, and becomes, as it were, perfectly candied with the lime. It is then fit for ſowing; and will infallibly produce a very abundant crop." Some farmers vary this ſteep, by adding to it a mixture of pigeons, or other dung; and in moſt parts of France, where this receipt is known, they omit the ſalt; perhaps becauſe it is too dear in that country, and ſteep the wheat in lime-water. For this purpoſe they put it into baſkets, and carefully ſkim off all that ſwims on the top, moſt of which would not ſprout, and is only fit to feed fowls.

The ſociety of improvers in the knowledge of agriculture in Scotland, call the following a very promiſing receipt for multiplying corn: but as no experiment that we know of, duly attended to, has yet confirmed that ſurmiſe, we can only ſay, that it may not be wrong to give it ſuch farther trials as will not hurt the experimentor, whether they do or do not ſucceed: a rule which ſhould be conſtantly obſerved in all experiments.

"Take as much water as will fully cover the quantity of grain you intend to uſe; add thereto a reaſonable quantity of a mixture of horſe, cow, and ſuch other dung as you can conveniently get, ſo as not to make the water too thick: add likewiſe for every boll (four buſhels) you are to ſteep, about a peck or ſixteenth part of the ſame ſort of grain as you are to ſteep. Boil all theſe till the grain is reduced to a pulp; keeping the kettle or cauldron cloſe covered, to retain the ſteam. When the boiling is over, pour off the water, and diſſolve in it a pound of nitre, or ſalt petre, to every four buſhels of corn: then, while it is luke-warm infuſe your corn for three days, after which, drain off the water, ſpread the grain on the floor, mix it with a ſufficient quantity of ſea-ſand, (if ſuch can be conveniently had), and laſtly, with lime, to dry it, as is uſually done in other caſes."

"It ſeems reaſonable to think," ſay the abovementioned ſociety, "that nothing can be more natural for impregnating grain, than the ſtrength and eſſence of itſelf. But, ſince nitre is added, it is beſt to be cautious: for it has been found by experience, that ſalts, though they have the virtues mentioned, kill or deſtroy the vegetative powers, when the application is immoderate, either with reſpect to the quantity, or the time the grain is ſteeped; ſo that there has often been a neceſſity to ſow over again with the ſame, or ſome other grain. To make the better judgment concerning this critical affair, the nature and condition of different grains are carefully to be conſidered; but the moſt certain knowledge and direction are to be obtained by a courſe of obſervations and experience. Mean while, it is beſt to obſerve the maxim, avoid extremes."

In Mr. Houghton's collection of papers relative to huſbandry and trade, are ſeveral experiments on the ſteeping of wheat and barley in a liquor which is there ſaid to have occaſioned a very great increaſe, and is thus made. "Take a quantity of rain-water, and diſſolve in every gallon of it two pounds of ſtone-lime: let it ſtand two or three days, ſtirring it three times a day: then pour off the water into another veſſel, and add to every gallon of it about four ounces of ſalt-petre, and one pound of pigeons dung: mix them well together, by ſtirring them three or four times a day, and then ſtrain off the liquor to keep for uſe." Mr. Everard, who communicated this receipt to Mr. Houghton, ſteeped a handful of wheat in a quart of this liquor, where he let it infuſe eighteen hours: he then took it out, and laid it to dry in the air for the ſpace of one day; and then ſteeped it again in the ſame liquor for about twelve hours, dried it as before, and ſteeped it again a third time, about ſix hours, after which he planted it in his garden, which was but common earth, ſetting it by ſingle grains, about ten inches aſunder, and a finger's length in depth. He could not remember whether every grain ſprouted, but thought that very few failed. Thoſe which did grow, produced an extraordinary increaſe, ſeveral of them yielding from ſixty to ſeventy, ſome of them eighty ſtalks with very large ears full of fine plump corn: many of the ears were ſix inches long, and contained ſixty grains: none had leſs than forty.

He alſo ſteeped peas and beans in the ſame liquor; but could not ſay whether their having been ſteeped two long was the cauſe that none of them came up: but he took the thick ſediment which remained after the liquor was ſtrained off, mixed it with four times the quantity of earth, let it lie all winter in a gravel walk, ſouth of a codlin hedge, then made a row of holes, about four inches diſtant, put a handful of the mixed earth into each hole, with a pea upon it, and covered it with common mould. The peas ſprouted well, ran up the codlin hedge to the height of about nine feet, ſhot out branches in ſeveral places, like vines, and bore ſo many well filled pods, that he judged he had above a buſhel from about three or fourſcore ſeeds.

He tried alſo an experiment on wheat infuſed in lime-water alone, ſome in brandy alone, and ſome in brandy and lime-water mixed, and had a great increaſe from each grain. With ſome of the liquor made with ſalt-petre, lime, and pigeons dung, he watered ſeveral trees in his garden, and found them grow and flouriſh much faſter than any other of the ſame kind which were not watered in that manner. He alſo ſteeped barley in the ſame liquor, and found its increaſe equal to that of wheat.

Whether there be, or be not, any kind of prolific efficacy in theſe, or any other ſteeps, of which great numbers are pompouſly recommended, and which proper experiments can beſt determine; they are at leaſt ſo far ſerviceable to the ſeed corn, that they clear it from filth, from many ſeeds of weeds, and from ſuch poor light and diſtempered grains as are not fit for ſowing, and prepare it in ſuch a manner, that, being already well moiſtened, it will ſhift much better than abſolutely dry grain, in caſe a drought ſhould enſue after it is ſowed.

This thorough cleanſing of the ſeed may probably be, in a great meaſure, the reaſon why corn ſo prepared is leaſt apt to produce ſmutty ears. All the lyes generally made uſe of, certainly preſerve the plants from mouldineſs, and that in which lime is a principal ingredient ſeems to be one of the moſt effectual. But as this part naturally leads to the diſtempers of corn, another very intricate, but highly intereſting ſubject, we ſhall reſume it under that head, to which it properly belongs; and give in the mean time M. Duhamel's farther opinion concerning the pretended prolific virtues of infuſions, with ſome late experiments relative thereto, as delivered in the ſixth volume of his excellent Treatiſe on the Culture of Land, publiſhed laſt year.

We liſten readily to the marvellous, eſpecially when it promiſes any great and ſingular advantage. Such was the abbé de Vallemont's prolific liquor, by means of which the huſbandman was to reap vaſt crops, without manuring, or ſcarcely plowing his land. He was only to ſoak his ſeed in this admirable liquid, which was to open, ſtrengthen, and amazingly fertilize the germe. Improbable as this doctrine is, it was greedily received.---It is known, that a ſeed contains in that part of it which is called the germe or bud, the embryo of a plant, that is to ſay, a plant in miniature, and that the reſt of the ſeed ſerves to feed the young plant, or plantule, till it acquires roots which draw its farther nouriſhment from the earth. As ſoon as theſe roots ſpread, the ſeed is exhauſted, and there remains only its then uſeleſs huſk. What benefit then can be derived from prolific liquors? perhaps they may render the nutritive ſubſtance of the ſeed fitter to ſupport the young plant, which, in conſequence thereof, may appear ſomewhat more vigorous at firſt, and till it has ſtruck out roots: but from the time of its producing thoſe roots, it ceaſes to ſubſiſt upon the lobes of the ſeed. Can it be imagined that a ſingle atom of any prolific liquor exiſts at the diſtance of four or ſix inches from the plants in the earth, where its roots are ſpread, and from whence they draw their ſubſiſtance? Yet, ſuch is the fondneſs of men for projects of this kind, de Vallemont's mixture was extolled as a wonderful diſcovery, indued with a magnetic virtue capable of attracting from the boſom of the air certain principles, which probably do not exiſt in it, and numbers of receipts have been deviſed for making prolific liquors. Writers upon agriculture have ſtuffed their books with them, and vaunted their miraculous effects. A deſire to ſee theſe mighty promiſes fulfilled, paved the way for their reception, and ill made experiments have given a ſanction to the error.

A little corn, impregnated with theſe pratended prolific liquors, has been planted grain by grain in a garden, and its extraordinary increaſe has immediately been imputed to the ſteep. I myſelf was deceived by ſuch trials: but when I extended them to three or four acres of ground, this great fertility no longer took place, and I began to doubt the efficacy of theſe boaſted ſpecifics. About the ſame time, I ſaw a ſingle grain of barley produce 230 ſtalks, without any preparation, and was informed by the Rev. Dr. Hales, that another grain of barley had in like manner, produced one hundred and fifty-four ears. From hence I concluded, that the prodigies of vegetation ſo much vaunted by ſome writers, as the effect of their favourite infuſions, have in fact been owing to the nature of the ſoil, to good culture, and to the grains being at ſuch diſtances from each other, that their roots have had room to ſpread, and thereby collect a great quantity of food. I then had recourſe to new experiments, which confirmed me in this opinion.

We ſee in the political ſtate of England, that a grain of wheat which grew by chance in a bed of onions, and had not received any preparation, produced 5600 grains. Upon which the author of that work remarks (as indeed I had done before in regard to the former of the abovementioned productions), that we muſt not from thence infer that the country where ſuch a thing happens is naturally more fertile than another, or the method of agriculture commonly practiſed in it better than elſewhere; for that the cauſe of theſe prodigious growths is, that the grains ſtand ſingle and in a good ſoil; that the only conſequence which can be drawn from thence, is that the new huſbandry comes neareſt to that ſtate in which theſe ſurpriſing growths are produced; that it certainly muſt increaſe the product of the crops; and that it will probably require leſs ſeed than is uſed in the common way.

Though it was pretty well proved by our experiments, that good culture and proper manures contribute more effectually to the increaſe of crops, than all the boaſted prolific liquors; yet ſeveral perſons, out of zeal for the public good, have publiſhed, ſome the advantages which they think ariſe from the uſe of certain fertilizing ſteeps, and others, receipts for making them.

In this ſpirit, M. de la Jutais has given us a little tract entitled, The true Philoſopher's Stone, according to which, an admirable prolific liquor is to be thus made. Fuſe ſome nitre in an iron veſſel; and when it is hot enough to burn the ſubſtances which are to be added, throw in a ſmall quantity of the ſame kind of ſeed as you intend to ſow: for example, if you would have a prolific liquor for wheat, throw a little wheat upon the nitre; if turnips, put in turnip ſeed, and ſo on. Theſe ſeeds take fire, are conſumed, and incorporate with the melted nitre. Your prolific liquor is then made, and you have only to mix the nitre with water. What reſults from this operation? Nothing more, than that there is in this prolific liquor a great deal of nitre with a ſmall portion of fixed nitre, or alkaline ſalt: whether this nitre be fixed with wheat, barley, turnip ſeed, or powder of coal, all chymiſts allow that the reſult will be the ſame, and that the ſame liquor might be made by mixing a little alkaline ſalt with a ſtrong ſolution of ſalt-petre. The queſtion is, what effect it will have upon vegetables. To try this fairly, two exactly ſimilar fields ſhould be ſowed, the one with wheat prepared with the prolific elixir, and the other with wheat only limed in the uſual way; taking care to ſow an equal quantity in each field: for the ſingle circumſtance of diminiſhing the quantity of the ſeed, may increaſe the crops in years when the corn does not tiller much, and in good ſoils. Many have been deceived by not attending to this circumſtance. The following are well made experiments.

" M. Delu, after trying M. de la Jutais's eſſence three times, with the moſt ſcrupulous care and exactneſs, thinks it of no ſort of ſervice.

" M. Peirol, whom I mentioned before, communicated to me in 1755, ſeveral experiments which he had made with great care, in order to ſatisfy himſelf whether theſe prolific liquors have any virtue; and thoſe trials made him then hope for ſucceſs. I thanked him for his obliging letters, and exhorted him to repeat the ſame experiments with ſome new precautions which I thought important. He did ſo, with all poſſible care; and it is with real pleaſure that I ſhall give a juſt account of them, becauſe they ſeem to me extremely fit to diſſuade thoſe who wiſh well to agricultre, from putting their truſt in ſuch illuſions. Inſtead of running after an empty ſhadow, they may employ their time in uſeful perquiſitions, by which the public will be benefited.

" M. Peirol ſowed, both in his own garden, and in that of the intendant of Auvergne, 1. many-eared wheat; 2. rath-ripe barley; 3. the common red wheat of the country; and had from each of them an amazing increaſe.

" Each plant of the many-eared wheat, had from fifty to ninety-two ſtalks, and theſe laſt yielded 13800 grins.

" Some of the rath-ripe barley had two hundred and forty-four ſtalks to each plant, and yielded 14640 grains.

" Several plants of the red wheat had three hundred ſtalks; but the grains were eaten by birds.

" Theſe were fine productions: but the moſt important thing to be obſerved here, is that M. Peirol ſowed all theſe different kinds of grain, as well in his own garden, as in that of the intendant, on the ſame day, viz. the 8th of September 1756; part of this corn having been ſteeped in the abbé de Vallemont's fertilizing liquor, while the reſt had not been infuſed at all: yet their productions were quite alike, the ground had been prepared exactly in the ſame manner for the ſteeped and the un-ſteeped grain, and both were equally watered from time to time with that prolific wafh. This laft circumftance fpoils the whole experiment: for who can doubt but that this watering of the plants with impregnations of dung, muft give them great vigour; even more than a confiderable quantity of dung itfelf would have done? However, the following experiment is, luckily, without that fault.

" On the 4th of April 1755, M. Peirol divided a pretty large field into five equal parts. The ground was in good tilth, and he fowed it with barley.

" The firft part was fowed with unfteeped barley in rows a foot afunder.

" The fecond was fowed with the fame kind of barley fteeped in de Vallemont's liquor, and likewife in rows a foot a funder. Both had a plowing between the rows, towards the end of April.

" The third was fowed in broad-caft according to the cuftom of the country, excepting that a quarter part of the ufual quantity of feed was retrenched: but ftill it was the fame fort of barley, and this had been fteeped in de Vallemont's liquor.

" The fourth divifion was alfo fowed in broad-caft, like the former; with this only difference, that the feed was fteeped in a prolific liquor invented by M. Robineau.

" Laftly, the fifth part was fowed intirely in the common way, with the ufual quantity of the fame kind of fead, un-fteeped.

" The following was the ftate of thefe five divifions at harveft time.

" The firft and fecond, which had been fowed in rows, with only a quarter part of the quantity of feed generally ufed in the common way, but prepared for the one by being infufed in de Vallemont's liquor, and fowed in the other without any impregnation, were both very fine, and yielded a great deal of grain.

" The third and fourth, which had been fowed in broad-caft, with an abatement of only a quarter part of the ufual quantity of feed, and where the grain for one had been fteeped in de Vallemont's liquor, and that for the other in M. Robineau's, were middling, and not vifibly different in any refpect.

" The fifth fpot, which had been fowed intirely in the common way, and with the ufual quantity of feed, was the worft of all.

" Though M. Peirol was prejudiced in favour of prolific effences, he neverthelefs concludes from this experiment, 1. That the un-fteeped grain ufed for the firft mentioned portion of the field, having yielded as fine a crop as that of the fecond which was fteeped, infufing the feed does not contribute much to make the plant's tiller.

" 2. That the products of the third and fourth divifions being quite alike, M. Robineau's fteep is not better than de Vallemont's.

" 3. That the difference between the crop of the fifth, and thofe of the third and fourth pieces of ground, was probably owing to the different quantity of feed.

" 4. That the fuperior beauty of the firft and fecond, which furpaffed all the reft, was occafioned by the grains being fo far diftant from each other, that the roots of the plants had fufficient room to collect their food, and that the hufbandman was enabled to ftir the ground between the rows, in the fpring, by which the vigour of the plants was confiderably increafed. All this confirms the advantages of the new hufbandry; and M. Peirol is fo convinced of it, that he has fowed a very large tract of land, near Riom, in the fame manner as the two firft parts of the above-mentioned experiment.

" He has likewife made another trial of de Vallemont's fpecific, by planting vines in two different places. In one of thefe, where the foil was good, the common practice was followed, and the cuttings fprouted foon: in the other, where the ground was lefs good, each cutting was watered with two quarts of de Vallemont's liquor. Thefe laft fhot out later, but then grew with great ftrength, and retained their leaves a long while. It cannot be doubted but that an infufion of dung will invigorate plants, and make them grow fafter than they would otherwife. The owners of vineyards are here to confider, whether the expence of people to do this bufinefs may not be greater than the advantages accruing from it will repay: but it is certain that by thus watering their newly planted cuttings, efpecially with a ftrong infufion of dung, they will fecure their taking root.

" To fatisfy myfelf in regard to M. Robineau's pretended prolific liquor, I chofe a piece of ground laid out for wheat, and divided it into three equal parts. One of thefe was fowed in the common way, with feeds only limed, and produced one hundred and ninety-two fheaves to the acre, which yielded fixty bufhels of corn. Another was likewife fowed in the common way, with feed only limed, but two fifths lefs in quantity than is generally ufed, and produced one hundred and fixty-eight fheaves, which yielded fifty-four bufhels. The third part was fowed with the fame quantity of feed as the firft, but prepared according to M. Robineau's direction. This produced one hundred and fifty-fix fheaves, which yielded fifty-four bufhels of grain. From whence it follows, that his method was not of any fervice to the crop.

" His liquor, when diftilled over a very flow fire, yields a little brandy; what remains in the matrafs, yields a great quantity of falt-petre, and the refidue is a bitter water which contains a fmall portion of alkaline falt. This is nearly what would be obtained from de la Jutais's liquor.

" M. Vandusfel has alfo tried M. Robineau's prolific liquor, and found it attended with no other effect, than that the field where it was ufed had fomewhat fewer fmutty ears than other grounds for which the feed had not been fo prepared. But other feed which he fteeped in an infufion of dung, afhes, and lime, produced corn totally exempt from fmut."

An ingenious correfpondent of the editors of the Mufeum Rufticum, has given us the following improved method of breeding feed-wheat.

" I join, fays this Effex farmer, with many others in opinion, that it is beft every year to change one's feed-wheat, and this has been my conftant practice: I have had many a weary ride to get feed that would pleafe me, for I am, and always have been, very difficult in this matter.

" I have near two hundred acres of land in conftant tillage: thefe I divide into three portions, fo that I have every year about fixty acres in wheat, fixty more in barley and oats: and the remainder are either fallow, or in beans, peas, or turnips, &c.

" When I firft came into my farm, I expended annually, of feed-wheat, thirty quarters; for, after the example of my neighbours, I allowed four bufhels of feed for every acre I fowed.

" Thefe thirty quarters often coft me above feventy pounds; and God knows I could fometimes but little fpare fo much money, after the great annual expence of getting in my harveft.

" Some part of my land differs greatly in its nature from the other: near half my farm is a ftiff deep clay; what bottom it has I know not, as I never could find it in digging my ditches, &c. the other half is a bed of light fandy loam; with a gravelly hard bottom.

" This difference in the foil of my farm is, on many accounts, a great advantage: particularly, my wheat does not all ripen at the fame time; I have generally nearly got in that growing on my gravelly land, before that on my clay is fit to cut; and I can befides plow in all weathers, froft excepted.

" But, not to digrefs too much, I took it into my head that, with proper care, I could breed for myfelf, on my own land, as good feed-wheat as any I could buy, if not better; and I determined within myfelf to make the experiment.

" Before I made this experiment, I had reduced the quantity of feed I ufed on each acre, to three bufhels, which was a great faving to me. I had ftill occafion for above twenty quarters.

" My firft ftep was to felect ten acres of the beft land I had; five from the heavy, and as many from the light part of my farm: this land was by nature rich and good; it lay on the gentle fouthern declivity of a hill, and required very little manure: it lay in two little detatched fields, at fome diftance one from the other.

" When I had prepared this land by a winter and fummer fallowing, in which time the clayey part was plowed feven times, and the light land five times, I had both

fields

fields fown with fome of the beft wheat I could procure; that for the heavy land I got from Hertfordfhire, the other from a particular friend who holds a farm in Cambridgefhire.

" When the feafon for fowing approached, I was mightily pleafed with the appearance of my two little plots; for they refembled the beft-kept gardens, not a weed to be feen, and the earth as fine as garden-mould.

" On this occafion I did not brine my feed, but had it put into a large tub: fome water was then poured on it, and I made a ftout labourer, with a ftiff half-worn birchen-broom, ftir it very brifkly about for near half an hour; this I imagined would wafh off the fmut, if any there happened to be: the light feeds, which were very few, were fkimmed off.

" I let the wheat afterwards lie three hours foaking, when my man again ftirred it brifkly with the fame broom, and immediately poured the water off.

" Whilft yet wet, the feed was fprinkled in the ufual manner with flaked lime, in order to prepare it for fowing.

" My reafon for not brining it was, that I thought it would bring it too forward; and I rather chofe to fow it early, which is, I know, in general, a very good practice.

" In fowing this land, I, in fome meafure, followed Mr. Tull's directions; that is, I fowed my wheat in rows with large intervals in the following manner.

" I had a furrow opened about a rod from the hedge: in this furrow fome feed was by a careful hand very thinly fcattered, not fowed in the common way with a fling of the arm.

" It took up time; fo I had two fowers to each plow. When the plowman had drawn the firft furrow, he then opened another, at about ten feet diftance from the firft in the land; and feed was in the fame manner thinly fcattered in this alfo: after this, he returned to the firft furrow, and drawing another clofe to it, covered the feed; the fame thing he did by the fecond furrow: he afterwards went two bouts without any feed being fown in the furrows; but the third bout, feed was thinly fcattered, as before, to form the fecond row of corn in each bed: another bout was made to cover the feed when the two beds were finifhed, the middle of the interval being left unplowed.

" In this manner both my little fields were fown, in double rows with intervals about five or fix feet wide betwixt the beds, and the rows about two feet afunder.

" The corn came up very well, and preferved a good wholefome appearance all the winter.

" Early in the fpring, that is, in the month of February, I made a careful man fow the fpaces betwixt the rows of corn on the heavy land with wood-afhes, and on the light land with foot: thefe were both foon wafhed in by the rain, and the effects were fpeedily to be feen in the new-affumed vigour of the crops, and this vigour continued till the corn was ripe.

" As foon as any weeds appeared, the intervals which were left unplowed at feed-time were turned up, and the fpaces betwixt the rows diligently hand-hoed: this hand-hoeing was feveral times repeated, to keep the crop quite clear from weeds, the intervals had alfo feveral other ftirrings; but this work was chiefly done with a very light plow, without an earth-board in the heavy land, and without either earth-board or coulter in the other little field.

" Every thing came very well forward; and when the wheat began to fpindle, I had the outfides of the rows well earthed-up with a plow, and the infides with a hand-hoe: the infides were done firft.

" At harveft the fields made a noble appearance: a fine well broke earth ftriped with rows of healthy wheat.

" The cutting this wheat was very eafily performed, it ftood fo ready to the reapers hands; and when it was houfed and threfhed, it yielded me about four quarters on an acre, one with another, the firft year, though I have fince had fometimes more, fometimes a little lefs.

" My ten acres then yielded me about forty quarters; and I had occafion for only about twenty-two to fow my common wheat-lands: I therefore took only the firft and prime part of this crop, getting the fheaves very lightly threfhed; what remained made excellent bread-corn.

" I never faw finer feed-wheat than mine was this year: my heavy lands I fowed with the feed produced by the light field, and my light lands with that produced by the heavy field.

" As foon as I had got in this felect crop, I got the intervals in order for fowing with a fecond crop, in moft refpects continuing the practice of the year before: I had the like fuccefs, and might, perhaps, with equal advantage, have continued cropping the fields every year in the fame manner: but, not to depend too much on Mr. Tull, my next crop was a full crop of barley on them, which fucceeded well: and I felected two other plots of ground, of equal goodnefs, for my feed-corn hufbandry, as I call it.

" In this manner I have now for feveral years paft managed, growing my own feed; and, if any thing, my crops have fince increafed: but I have again reduced the quantity from three to two bufhels of feed, for each acre of my wheat-land in common: that is, fuch as I fow in the ordinary way: on fome of my rich, ftrong land, I do not ufe above fix pecks, and find it anfwer very well.

" I could like to extend this new hufbandry, or this imitation at leaft of the new hufbandry, over all my lands that are in tillage: but in my method of practifing, the expence would be too great: my fowers are well paid; I have enough to do to make my plowmen go out of their ordinary way; and it cofts me a great deal hoeing: yet all this I do not grudge to procure good feed.

" By introducing the drill-plow and the horfe-hoe I could fave a great deal of labour on my light lands; and I may probably fome time or other attempt it: but, at the fame time, I am very fenfible, I fhall find great difficulty in getting men that will even try to do the work with thefe inftruments. The common labourers in hufbandry hate novelty: they purfue, without murmuring, the old beaten track; but put them out of it, and thought will become neceffary: the fact is, they imagine it a very great hardfhip to be obliged to work and think too, and all for the fame money.

" Without great refolution, and fome kind of authority, a farmer will be obliged to let them even dig a ditch their own way: innovation they like not in any fhape, often making ufe of the expreffion, that they are too old to learn.

" This, to a man who is very much difpofed to lend a helping hand towards the improvement of agriculture, is a mortifying circumftance: there is fcarcely any thing fo difficult as to make an obftinate man ufeful: if, by dint of authority, you oblige him to go out of his way, he will rather contribute to the lofs of your crop, than not to endeavour to convince you that he is in the right. I have often, to my forrow, felt the truth of this obfervation.

" Several reafons, though I deal not much in them, may be affigned for the feed-wheat, I raife in the above defcribed manner, being fo good.

" In the firft place, I fow it on land that has not tafted any dung for fome years, but is, in its own nature, rich and good: to this practice I afcribe a great deal of its goodnefs. In the next place, as the corn does not ftand too thick, it enjoys all the benefit it can receive from the fun and air: by this means it attains a perfect maturity, and is certainly improved both in bulk and quality.

" The flight fpring-dreffing I give it, of foot or afhes, is of very great fervice: it warms the roots, and brings the corn forward; it loofens the earth, and either itfelf gives nourifhment to the plants, or, at leaft, puts the earth in a difpofition to afford it.

" Not a little is to be attributed to the frequent hoeing betwixt the rows and the ftirings of the intervals; and I find one very particular and great advantage refult from it, which is, that it is an excellent means of clearing my land of weeds; for they no fooner attain a part of their growth, but they are deftroyed long before they feed.

" Farmers in general think their fields cannot in the fpring be too full of wheat-plants: the ground feems covered with verdure, and the blades are, as it were, crouded for want of room: when the weeds begin to get up, they fend

fend in a parcel of men and women with weeding-hooks, not letting a hoe come near the land to cut them up: they are fadly afraid they fhould not have plants enough at harveft; whereas, if they were to meafure and mark off a rod fquare of land in February, and count the plants growing on it then, and afterwards count them in the beginning of Auguft, it would almoft always be found, that four parts in five of them had perifhed in the intermediate months, and that what remained were, by far too much crouded ftill, and had each but few ftalks.

"I never weed my corn of late years; for as I allow only two bufhels of feed, and often lefs, to an acre, the plants come up thin; and there is of courfe room for a moderate-fized hoe, which is the inftrument I clean my land with: and fo far from being fearful of having my crop injured by this means, I order the workmen, where the plants ftand too clofe, to cut them up without mercy, as they would do the moft pernicious weeds: if there happens by any accident to be a vacant fpot, they eafily remove fome plants to it, with earth about their roots, by the help of their hoe.

"By this management, I, in fome meafure, reap the benefit of the advantages promifed by the new hufbandry; though I have not fuch opportunities of fo often giving the plants a frefh fupply of nourifhment, nor of earthing them up when the grain is forming in the ear; for, after the corn has put forth its ftalks to any confiderable length, it would not be fo proper to fend in the hoers: but all the lofs is the want of earthing up the plants fo late as I could wifh; for the weeds will, before this time, be pretty well got under, and few of them will be able to ripen their feeds before harveft, when they will of courfe be deftroyed by turning in the ftubble, which I always do as foon as poffible; though many of my neighbours let their ftubbles lie rough all the winter, for the fake of feeding a few fcore of ewes.

"Every farmer has methods peculiar to himfelf; and they are, for the moft part, fuch as were practifed by their fathers, grandfathers, &c. whom they fucceeded in the culture of their farms.

"My methods, as you muft now be fenfible, differ from moft of thofe ufed by other occupiers of land; and if I cannot fo well defend them by arguments, an experience of feveral years has convinced me that I ought ftill to perfift in the practice of them: they have anfwered all the ends I could wifh from them; what could I defire more?

"I am enabled to raife all my own feed without the trouble of procuring it from a great diftance, at a large expence, and with a deal of trouble.

"My crops are to the full as good as ever they were, and I ufe lefs feed by above one half: my manure goes a great deal farther than it ufed to do, becaufe I beftow more plowing and other tillage on my land; and I am not fo much peftered as I formerly was with weeds, for they now very feldom are fuffered to feed on my land.

"Of this laft evil, I mean that of weeds, I have not, however, yet got quite rid; for fuch of my fields as border on my neighbours lands are ftill often infefted; fome of thefe fame neighbours, I have feveral times mentioned, are but flovenly farmers, and the weeds which have winged or downy feeds, are conftantly wafted by the wind from their land to mine; fo that I, in fome meafure, am punifhed for their neglects: thiftles are this way particularly troublefome, as the feeds of them will fometimes be carried a very confiderable way by the wind.

"I have very little more to fay at this time, except that I never threfh the fheaves that are to fupply me with feed-corn till juft when I want to make ufe of it. I have a notion, that the feed keeps better in the covering nature has given it, I mean the chaff, than it would do without it; and I am pretty certain it fprouts fooner in the ground, the hufk or bran of the grain being preferved in a tenderer and more yielding ftate, than it would be were it expofed to the open air."

With regard to the feeds of plants fown in the kitchen-garden, all of them fhould be gathered in dry weather, when there is not any moifture upon them; and the beft way to preferve them is, to hang them up in bags, in a dry room, where vermin cannot come at them. The temperature of this place fhould be moderate; left either too much warmth, or a too ftrong current of air, fhould make them dry, and confequently decay, fooner than they would otherwife do: and at the fame time care muft be taken not to exclude the air totally from them; it having been repeatedly experienced, that feeds kept long in bottles clofely ftopped have entirely loft the power of growing. They will keep longeft in their pods, when they can be fo laid up, becaufe thofe coverings not only defend them from the injuries of the outward air, but, fo long as they are not disjoined from them, continue to fupply them with a degree of nourifhment which helps to maintain them in a plump ftate, fit for vegetation. The feeds of all foft fruits, fuch as cucumbers, melons, &c. are of courfe excepted from this general rule; for they muft be well cleanfed from their furrounding pulp, the rotting of which would otherwife foon corrupt them. Thofe of melons in particular, are fo far benefited by being kept in a warmer ftate than would fuit any others, that the plants produced from them are thereby rendered the lefs luxuriant, and therefore more fruitful: for which reafon it is that many people carry them in an inner pocket of their breeches for fix weeks or two months before they fow them, in order to exhale part of their moifture; and in effect, this will weaken them as much as two years keeping them in the common way.

Thofe feeds which fwim upon the furface of water, when they are put to that trial of their goodnefs, fhould be rejected for fowing; becaufe, as hath already been frequently obferved, though many of them will grow, they never produce fo good plants, or fo fine fruit, as the fuller, plumper, and more perfect ones, which fink to the bottom.

The age at which it is beft to fow the feeds of the plants before treated of, and the time to which they will keep good, are thus afcertained by Mr. Miller, after many years experience and very accurate obfervation.

The feeds of afparagus, bafil, beans, beet, borage, capficum, carrots, celeri, chervil, creffes, endive, fennel, finocchia, hyffop, kidney-beans, lavender, leeks, lentils, marjoram, marigolds, onions, parfley, parfneps, peas, purflain, radifhes, favory, fkirrets, fpinnage, thyme, and turneps, are beft fown the firft fpring after they have been faved; and indeed many of them will not grow if they are kept longer.

Thofe of cabbages, colliflowers, endive, lavender, lettuce, muftard, and forrel, will not be the worfe for keeping two years, if they are well preferved; though all of thefe are equally good for ufe the firft year.

The feeds of cabbages, cucumbers, lettuces, melons, and favoys, will grow very well at the end of three years, if they have been properly faved and kept. Some of them, and particularly thofe of cucumbers and melons, are generally reckoned beft when they are three years old; becaufe, when they are new, the plants produced by them will grow too vigorous, and yield but a fmall quantity of fruit. However, none of thefe feeds fhould be kept longer than four or five years, though they well grow at the end of nine or ten: but then their plants will be weak, and their fruit fmall.

The feeds of fennel will frequently remain in the earth a whole year, efpecially if they are fown in the fpring; fo that whenever the plants do not come up the firft year, the ground fhould be left undifturbed till the following fpring, except only keeping it clear from weeds, and the plants will then appear.

SEEDLINGS, young plants which have not been removed from the beds where they have been fown. It is alfo ufed to diftinguifh plants raifed from feeds from thofe of the fame kind which have been propagated by layers or cuttings.

SEED-LIP, SEED-LEAP, *or* SEED-LOP, a feed-bafket, or the veffel in which the fower carries his feed, in order to fow it.

SEELING, a term ufed by horfe-dealers to imply the time when a horfe begins to have white eye-brows; that is, when there grows on that part about the breadth of a farthing, a parcel of white hair, mixed with thofe of his natural colour. This is a mark of old age, a horfe never feeling before he is fourteen, and always before he is fixteen years old.

SELANDERS. *See* SALENDERS.

SEMBRADOR, an inftrument ufed in Spain for fowing corn. *See the article* DRILL-PLOUGH.

SEMIFISTULAR-*Flowers*, are thofe whofe upper part refembles a pipe cut off obliquely.

SEMIFLOSCULOUS-*Flowers*, are thofe whofe petals are hollow in their lower part; but in their upper flat, and continued in the fhape of a tongue.

SEMINARY, a feed plat, or place allotted for raifing plants from feed, and keeping them till they are fit to be removed into the garden or nurfery. *See the article* NURSERY.

SERRATED, indented, or notched, in the manner of a faw.

SERVICE-*Tree*, the name of a tree that grows naturally in many parts of England; and if fuffered to ftand, will become very large. The ftems are covered with a fmooth gray bark; the branches, while young, have a purplifh brown bark. The leaves are winged, fharply fawed on their edges; and, during the fpring, are hoary on their under fides. The flowers are produced in large branches, almoft in the form of umbels, at the ends of the branches; they appear in May, and are fucceeded by roundifh berries, growing in large bunches, which have a depreffed navel on the top, and turn red in autumn, when they ripen.

Though the fruit of the fervice-tree is not much efteemed in England, it is often ferved up to the table, as a part of the defert, in the fouth of France, and in Italy, where there is no want of a variety of fine fruits. The fpecies there is indeed much larger than ours: but as Mr. Evelyn has left us no room to doubt that our wilder fort, which grows naturally in many parts of England, may, like all other plants, be greatly improved by due culture, it is well worth the hufbandman's while to give it a place in his orchard, or other ground. Mr. Miller too gives more than one inftance of his having feen the fervice-tree brought to great perfection in this country. He has obferved three forts (Mr. Evelyn noted four) of our native growth, the fruit of one of which is fhaped like a pear, and that of the other like an apple. The former, which refembles moft the foreign fpecies abovementioned, is the beft and the largeft grower; for it will fometimes attain to the height of near forty feet.

It is a common, but a very miftaken faying, that the fower of thefe trees never fees the fruit of his labour. This notion may have arifen from their bearing moft plentifully when they are very old: but, with proper care, they may be made to produce fruit in a few years, even from the time of raifing them from their feeds; and if they are propagated by layers, or cuttings, they will foon begin to repay the pains beftowed on them.

To propagate them from their feeds, of which there are three in each berry, or chequer, as fome call this fruit, the pulp fhould be rubbed off clean, with dry fand, foon after the fruit is ripe, and the feeds, which are of a hard ftrong nature, fhould then, according to Mr. Miller's directions, be fown in pots, for the convenience of plunging thefe into a moderate hot-bed in the fpring, in order to forward their growth: for it will be fufficient to fhelter them under a common frame during the intermediate winter. When the plants are come up, they fhould be kept clear from weeds, watered in dry weather, and expofed to the open air: for a clofe hot bed would then draw them up fo weak as to fpoil them; nor indeed is any thing more intended here by this method of raifing them, than to make the feeds fprout fooner than they would do in the common open ground, which, that circumftance excepted, will do equally well, as thefe plants are very far from being tender. About the middle of October, at which time their leaves will decay, they fhould be taken out of the pots in the hot bed, and planted in the nurfery, in rows two feet afunder, and a foot apart in the rows. A little mulch fhould be laid upon the furface of the ground, over their roots, in the winter, to protect them from being injured by froft before they have well taken root, and in the next fpring the ground between them fhould be dug, and the mulch buried therein, with care not to cut or injure their tender roots. With this management, and keeping them conftantly clear from weeds, they will be fit in three or four years, according to their growth, to be tranfplanted into the places where they are to remain: but previous to this it will certainly be right to graft them, as Mr. Evelyn advifes, for the greater improvement of their fruit. They take well either on their own fpecies, or on the white thorn, the quince, or the medlar. The beft feafon for removing them from the nurfery is in October, or in the fpring juft before they begin to fhoot, and the foil in which they thrive beft, fooneft produce fruit, and laft the longeft, is a moift ftrong ground, defended from cold wind. However, they will grow even in the moft expofed places, and thrive where few other trees will fucceed; for they are extremely hardy. This renders them well worthy of the hufbandman's attention, as well for their timber (which will be fpoken of hereafter) as for their fruit. This laft makes a pretty appearance when ripe; but the black birds and thrufhes are fo fond of it, that they devour all they can come at. A way, therefore, to draw thefe warbling fongfters about an habitation, is to plant a quantity of thefe trees for that purpofe. Like the medlar, this fruit muft be kept till it is almoft rotten, before it will be fit to eat.

SETTER, a kind of fetom or iffue, made by cutting a hole in the dewlap of an ox or cow, and putting into the wound a fort of tent formed out of the root of hellebofter; by which the ill humours vent themfelves.

To SEW, *or go* SEW, to go dry; fpoken of a cow.

SHAKING, a difeafe incident to fheep, confifting of a weaknefs in their hinder quarters, fo that they cannot rife up when they are down. No cure is yet known for it.

SHARD, a fragment of an earthen veffel.

SHARE *of a Plough*, that part which cuts the ground, the extremety forward being covered with a fharp-pointed iron, called the point of the fhare; and the end of the wood behind, the tail of the fhare. *See the article* PLOUGH.

The length of the whole fhare from point to tail, according to Tull, fhould be three feet nine inches; at the top of the iron it has an upright piece called the fin; and near the iron at the other end, there is an oblong fquared hollow, called the focket; the ufe of which is to receive the bottom of the fheat. Near the tail there is a thin plate of iron, well riveted to the wood; by means of this plate the tail of the fhare is held firmly to the hinder fheat of the plough by a fmall iron pin, with a fkrew at the end, and a nut fkrewed on it, on the inner or right fide of the fheat.

The point of the fhare is that part in which it does not run up into the fin: this point is generally made of three inches and a half in length, and fhould be flat underneath, and round at the top, and the lower part of it muft be of hard fteel. The edge of the fin fhould alfo be well fteeled, and fhould make an acute angle with the fhare.

The focket is a fort of mortife; it fhould be a foot long, and about two inches deep: the fore-end of it muft not be perpendicular, but oblique, conformable to the end of the fheat which enters into it. The upper edge of the fore-part muft be always made to bear againft the fheat; but, if this end of the focket fhould not be quite fo oblique as the fheat, it may be helped by paring off a fmall part of the wood at the point.

SHAW, a wood that encompaffes a clofe.

SHAWLE, a fhovel ufed in winnowing corn.

SHEARING *of Sheep*, the operation of cutting off the fleece or coat of wool with a pair of fhears. *See the article* SHEEP.

SHEAT *of a Plough*, that part of the plough which paffes through the beam, and is faftened to the fhare.

The fheat, or as it is fometimes called the fore-fheat, there being another piece of timber behind it called the hinder fheat, fhould be feven inches wide, and faftened to the beam by a retch (a piece of iron with two legs) and by a wedge driven by it into the hole of the beam. The angle contained between the fheat and the beam of the plough fhould be about forty-two degrees.

SHEAVES, bundles of corn bound up in the field. *See the article* HARVEST.

SHED, a flight temporary covering.

SHEEP, *ovis*, in zoology, a well known fpecies of cattle, and which are kept at the leaft expence of any to the

the farmer. They will thrive upon almoſt any ground, and for that reaſon are preferred by many before the larger cattle.

The beſt ſort of ſheep for fine wool are thoſe bred in Herefordſhire and Worceſterſhire, but they are ſmall and black-faced, and bear but a ſmall quantity.

Warwick, Leiceſter, Buckingham, and Northamptonſhire, breed a large boned ſheep, of the beſt ſhape, and deepeſt wool we have got. The marſhes of Lincolnſhire breed a very large kind of ſheep, but their wool is not good, unleſs the breed be mended by bringing in ſheep of other countries among them, which is a ſcheme of late very profitably followed there.

The northern counties in general breed ſheep with long, but hairy wool: and Wales breeds a ſmall hardy kind of ſheep which has the beſt-taſted fleſh, but the worſt wool of all.

The farmer ſhould always buy his ſheep from a worſe land than his own, and they ſhould be big-boned, and have a long greaſy wool, curling cloſe and well. Theſe ſheep always breed the fineſt wool, and alſo are the moſt approved of by the butcher for ſale in the market.

For the choice of ſheep to breed, the ram muſt be young, and his ſkin of the ſame colour with his wool, for the lambs will be of the ſame colour with his ſkin. He ſhould have a large long body, a broad forehead, round, and well riſing, large eyes, and ſtraight and ſhort noſtrils. The polled ſheep, that is, thoſe which have no horns, are found to be the beſt breaders. The ewe ſhould have a broad back, a large bending neck, ſmall, but ſhort; clean and nimble legs, and a thick deep wool covering her all over. To know whether they be ſound or not, the farmer ſhould examine the wool that none of it be wanting, and ſee that the gums be red, the teeth white and even, and the briſket ſkin red, the wool firm, the breath ſweet, and the feet not hot. Two years old is the beſt time for beginning to breed, and their firſt lambs ſhould not be kept too long, to weaken them by ſuckling, but be ſold as ſoon as conveniently may be. They will breed advantageouſly, till they are ſeven years old.

The farmers have a method of knowing the age of a ſheep, as a horſe's is known, by the mouth. When a ſheep is one ſhear, as they expreſs it, it has two broad teeth before; when it is two ſhear, it will have four; when three, ſix; when four, eight; after this their mouths begin to break. The difference of land makes a very great difference in the ſheep.

The fat paſtures breed ſtraight tall ſheep, and the barren hills and downs breed ſquare ſhort ones; woods and mountains breed tall and ſlender ſheep, but the beſt of all are thoſe bred upon new plowed land, and dry grounds. On the contrary, all wet and moiſt lands are bad for ſheep, eſpecially ſuch as are ſubject to be overflowed, and to have ſand and dirt left on them. The ſalt marſhes are, however, an exception to this general rule, for their ſaltneſs makes amends for their moiſture, any thing of ſalt, by reaſon of its drying quality, being of great advantage to ſheep.

As to the time of putting the rams to the ewes, the farmer muſt conſider at what time of the ſpring his graſs will be fit to maintain them and their lambs, and whether he has turneps to do it till the graſs comes; for very often both the ewes and lambs are deſtroyed by the want of food; or, if this does not happen, if the lambs are only ſtunted in their growth by it, it is an accident that they never recover. The ewe goes twenty weeks with lamb, and according to this it is eaſy to calculate the proper time. The beſt time for them to yean is in April, unleſs the owner has very forward graſs, or turneps, or the ſheep are field ſheep, where you have not incloſures to keep them in, then it may be proper they ſhould yearn in January, that the lambs may be ſtrong by May-day, and be able to follow the dam over the fallows, and water furrows; but then the lambs that come ſo early, muſt have a great deal of care taken of them, and ſo indeed ſhould all other lambs at their firſt falling, elſe, while they are weak, the crows and magpies will peck their eyes out.

When ſheep are turned into fields of wheat or rye to feed, it muſt not be too rank firſt, for, if it be, it generally throws them into ſcowerings. Ewes that are big ſhould be kept but bare, for it is very dangerous to them to be fat at the time of their bringing forth their young. They may be well fed indeed, like cows, a fortnight before-hand, to put them in heart. *Mortimer's Huſbandry.*

The feeding ſheep with turneps is one great advantage to the farmers, from the crops they raiſe of them: they ſoon fatten upon them, but there is ſome difficulty in getting them to feed on them; the old ones always refuſe them at firſt, and will ſometimes faſt three or four days, till almoſt famiſhed; but the young lambs fall to at once.

The common way, in ſome places, of turning a flock of ſheep at large into a field of turneps, is very diſadvantageous, for they will thus deſtroy as many in a fortnight, as would have kept them a whole winter. There are three other ways of feeding them on this food, all of which have their ſeveral advantages.

The firſt way is to divide the land by hurdles, and allow the ſheep to come upon ſuch a portion only at a time, as they can eat in one day, and ſo advance the hurdles farther into the ground daily, till all be eaten. This is infinitely better than the former random method, but they never eat them clean even this way, but leave the bottoms and outſides ſcooped in the ground; the people pull up theſe indeed with iron crooks, and lay them before the ſheep again, but they are commonly ſo fouled with the creature's dung and urine, and with the dirt from their feet, that they do not care for them; they eat but little of them, and what they do, does not nouriſh them like the freſh roots.

The ſecond way is by incloſing the ſheep in hurdles, as in the former, but in this they pull up all the turneps they ſuppoſe the ſheep can eat in one day, and daily remove the hurdles over the ground, whence they have pulled up the turneps: by this means there is no waſte, and leſs expence, for a perſon may in two hours pull up all thoſe turneps; the remaining ſhells of which would have employed three or four labourers a day to get up with their crooks out of the ground, trodden hard by the feet of the ſheep; and the worſt is, that as, in the method of pulling up firſt, the turnips are eat up clean; in this way, by the hook, they are waſted, the ſheep do not eat any great part of them, and when the ground comes to be tilled afterwards for a crop of corn, the fragments of the turnips are ſeen in ſuch quantities on the ſurface, that half the crop at leaſt ſeems to have been waſted.

The third manner is to pull up the turneps, and remove them in a cart or waggon to ſome other place, ſpreading them on a freſh place every day; by this means the ſheep will eat them up clean, both roots and leaves. The great advantage of this method is, when there is a land not far off which wants dung more than that where the turneps grow, which perhaps is alſo too wet for the ſheep in winter, and then the turneps will, by the too great moiſture and dirt of the ſoil, ſometimes ſpoil the ſheep, and give them the rot. Yet ſuch ground will often bring forth more and larger turneps than dry land; and when they are carried off, and eaten by the ſheep on ploughed land in dry weather, and on green ſward in wet weather, the ſheep will ſucceed much the better; and the moiſt ſoil, where the turneps grow, not being trodden by the ſheep, will be much fitter for a crop of corn, than if they had been fed with the turneps on it. The expence of hurdles, and the trouble of moving them is ſaved in this caſe, and this will counterbalance at leaſt the expence of pulling the turneps, and carrying them to the places where they are to be eaten. They muſt always be carried off for oxen. *Tull's Horſe-hoeing Huſbandry.*

"It can hardly be doubted, ſays M. de Buffon, but that thoſe animals which are at preſent tame and domeſtic, were formerly wild. Yet the weakneſs and ſtupidity of the ſheep being conſidered, and likewiſe that this defenceleſs animal cannot ſave itſelf by flight; that all carnivorous animals are his enemies, ſingling it out in preference to others, and devouring it for the fineneſs of its fleſh: at the ſame time we muſt remember that this ſpecies is not very prolific, and that each individual is but ſhort-lived: when theſe particulars are conſidered, we ſhould be inclined to think, that from the beginning of things, the ſheep has been committed to the care of man; that his protection is neceſſary to its ſubſiſtance, and his care to its

its multiplying; nor are any desarts known to afford wild sheep; but in all places where man does not govern, the lion, the tyger, and the wolf, reign by violence and cruelty; these voracious animals live longer, and multiply much faster than the sheep: and were we even now to forsake the numerous flocks fed in the pastures, and on the hills, they would soon be destroyed before our eyes, and the whole species extirpated by the number and voracious appetites of carnivorous animals.

"Thus it appears that this species is indebted to our assistance and care for its continuance; for it could not subsist of itself. The sheep is absolutely without defence or resource; the weapons of the ram are but weak; his courage nothing more than a petulance, troublesome to others, useless to himself, and destroyed by castration. The weathers are still more timorous than the ewes. It is from fear that they so often assemble in flocks; the least uncommon noise causes them to leap over each other, or gather close together; while this fear is attended with the grossest stupidity: they have not sense to avoid danger; they even appear not to feel their disagreeable situation; they stray wherever they happen to be, whether it rain or snow; and such is their obstinacy, that in order to make them change their place, or follow any road, they must have a leader, trained to walk before them, whose motions they readily follow step by step. This leader himself would stir no more than the rest of the flock, were he not driven by the shepherd, or hunted by the guardian dog, which is taught to protect and defend them; to guide, separate, gather them together, and direct them in their motions.

"Sheep, therefore, of all quadruped animals are the most stupid, and have the least instinct and contrivance. The goats, which in so many respects resemble them, have much more sagacity: they stand in need of no guide, they shun dangers; new objects soon become familiar to them; whereas the stupid sheep neither shuns nor approaches: though under the greatest want of assistance, they do not approach man so freely as the goat; and what in animals seems the lowest degree either of fear or insensibility, they see their lambs taken away without anger, without resistance, and without expressing their grief by any cry different from their common bleating.

"But this animal, in itself so despicable, so destitute of sentiment and internal qualities, is to man the most valuable; its utility the most immediate and extensive: it alone satisfies wants of the greatest necessity; it furnishes both food and apparel, besides the advantages arising from the suet, milk, skin, intrails, bones, and dung of this creature, to which nature seems to have given nothing as its property; all is to be delivered up to man.

"Love, the most general and active sentiment, is alone able to impart some vivacity to the ram: he becomes wanton, fights, rushes against the other rams, and sometimes even attacks his shepherd; but the ewe, when in heat, seems not at all the more affected, or the more animated; her instinct reaches no farther than not to refuse the ram's approaches; to chuse her food, and know her lamb. The instinct of this animal is the surer, as it is more mechanical; and, if I may be allowed the expression, the more innate. A young lamb will, amidst a numerous flock, find its dam and seize the dug, without ever being mistaken. Sheep are also said to be impressed by modulated sounds, to feed more assiduously, to be in better health, and to fatten sooner by the sound of a pipe; and that they are evidently sensible of the charms of music. But it is also said, and I believe with more truth, that music rather serves to amuse the shepherd's tedious hours, and that to this supine and solitary life the origin of that art is owing.

"These animals, whose instinct is so simple, are also of a very weak constitution; they cannot bear walking any length of time; travelling exhausts them; running soon puts them out of breath; the scorching rays of the sun hurt them equally with the rain and snow. Their diseases are many, and most of them contagious. The superabundance of their fat often proves fatal to them, and always hinders their fruitfulness; they yean with difficulty; they frequently cast their lambs, and require more care than any other domestic animal.

"When a ewe is near yeaning, she must be separated from the flock, and watched, in order to be assisted; the lamb often presents itself a-thwart, or with its feet first; and in this case, without assistance, the ewe's life would be in danger. After yeaning, the lamb is raised on his feet; at the same time all the milk in the ewe's udder is milked out, it being vitiated, and very noxious to the lamb, which is kept from sucking till the udder is filled with fresh milk: the lamb is kept warm, and for three or four days shut up with the ewe, that it may learn to know her, during which time the ewe is fed with good hay, barley-meal, or bran mixed with a little salt; and water, whose chill is taken off, and mixed with a little quantity of flour, bean-meal, or ground millet, given her to drink. At the end of four or five days she may be gradually fed like the rest, and sent with the flock, taking care that she be not driven too far, lest her milk be heated. Some time after, when the sucking lamb shall have gathered strength, and begins to play, no farther care is requisite; it may be left to follow its dam to the pastures.

"All the lambs of a weakly appearance are generally disposed of to the butcher; those intended to be kept being the largest, most vigorous, and having the thickest fleece. Lambs of the first yeaning are never so good as the following. To bring up lambs yeaned in the months of October, November, December, January, and February, they must be kept in the house during the winter, going out only in the morning and evening to suck; but in the beginning of April they may be turned into the open fields. Some time before this a little grass is daily given them, in order to habituate them by degrees to this new food. They may be weaned at the end of one month; but it is better to delay it for six weeks or two months. White lambs, without spots, are always preferred to the black or mottled; white wool being more valuable than the black or mixed.

"The proper age for castration is at the end of five or six months, or even a little later in spring or autumn, when the weather is mild. This operation is performed by two different methods; the most common is by incision, when the testicles, which are easily separated, are drawn out through the wound: the other is performed without incision, by tying a string very tight round the scrotum above the testicles: for this compression destroys the vessels which supplies them with blood and juices. The lamb, on castration, becomes sickish and dull, so that it would not be improper to give him, for two or three days, a little bran mixed with a small quantity of salt, to prevent a loss of appetite, which this operation often causes.

"At the end of a year, rams, sheep, and weathers lose the two fore-teeth of the lower jaw; and they are known to want the incisive teeth in the upper jaw. At eighteen months the two teeth joining to the former, also fall out; and at three years, being all re-placed, they are even and pretty white. But as the creature advances in age they become loose, blunt, and afterwards black. The age of the ram is also known by his horns, which shew themselves in the very first year, and often at the birth, and continue to grow a ring annually to the very period of life. Though sheep are often without horns, yet they have bony prominences in the same places of the head, where the horns of rams appear. Some sheep however have two, and others four horns, five or six inches in length, but less twisted than those of the ram; when there are four, the two outward are shorter than the others.

"The ram is capable of generating at eighteen months, and a ewe may yean at the end of a year; but it is better to delay it till the ewe be two, and the ram three years old. The produce of these animals, if too early, and even the first, is always weak, and of a bad constitution. One ram will be sufficient for twenty-five or thirty ewes; but he should be remarkable for strength and comeliness. He must also have horns; for some have none, and such, in these climates, are very indifferent. In a good and comely ram, the head must be large and thick, the forehead broad, the eyes large and black, the nose short, the neck thick, the body long and raised, the back and rump broad, the testicles large, and the tail long. The best are white, with a large quantity of wool on the belly, tail, head and ears, down to the eyes. The best sheep for propagation are those which have most wool, and that close, long, silky, and white; especially if at the same time they have a large body, a thick neck, and a light method of walking. And it has been already observed, that those which were rather lean than fat, bring forth more easily than others.

"The season of the ewe's heat is from the beginning of November to the end of April; but they may be brought to conceive in any season, by giving them provocative foods, as salt water, and bread of hemp-seed. Each ewe is covered three or four times, and then separated from the ram, which always prefers the older sheep, and neglects the younger. In the season of copulation they should not be exposed to the rain or bad weather, wet hindering their retention; and a clap of thunder often produces abortion. A day or two after being covered, they are put again to their common diet, without having any more salt water; the continual use of which, as well as that of hemp-seed bread, and other hot aliments, would infallibly cause abortion. They go five months, and yean at the beginning of the sixth; they seldom bring two lambs. In hot climates they yean twice a year: but in France, and the colder countries, only once. Some have the ram given to them about the end of July or the beginning of August, in order to have lambs in the month of January; but the ram is given to a much greater number in the months of September, October, and November; and lambs are in great plenty in February, March, and April. They are also to be had in the months of May, June, July, August, and September, there being no scarcity of them but in October, November and December. The ewe yields, during seven or eight months, plenty of milk, which is a good food for children and peasants. It also makes good cheese, especially if mixed with that of cows. The time for milking ewes is immediately on their going out to pasture, or on their return; twice a day in summer, and once in winter.

"Ewes fatten very fast during their pregnancy, as they then eat more than at other times. As they often hurt themselves, and frequently miscarry, so they sometimes become barren; and it is not very extraordinary for them to bring forth monstrous productions. However, when properly tended, they are capable of yeaning during their whole life; that is, to the age of ten or twelve years; but generally, when they are turned of seven or eight, they break, and become sickly. A ram lives to twelve or fourteen years; but after eight is no longer fit for propagation: he should then be knit and fattened with the old sheep. The flesh of the ram, though knit and fattened, is but of a bad taste; that of the old ewe flabby and insipid; whereas that of the weather is the most succulent, and the best of all common meats.

"To form a flock, from which a reasonable profit may be expected, sheep and weathers must be purchased, of about eighteen months, or two years old; and one shepherd, if careful, and assisted by a good dog, may take care of a hundred. In leading them out to pasture he should go before them, and accustom them to know his voice, to follow him without stopping, or straying among the corn, woods, aud fallow lands, where they would do damage. The places that best agree with them are downs, and small eminencies; low, wet, and marshy grounds should be avoided.

"During the winter, they are fed at home with bran, turneps, hay, straw, lucern, saintfoin, the leaves of elm, ash, &c. They are, however, led out every day, unless the weather be very bad; tho' this is rather to walk than feed them; and in this inclement season, it is always near ten in the morning before they are led out; and after staying four or five hours, they are watered, and brought back about three in the afternoon; whereas in spring and autumn, they are led to the field as soon as the sun has dispersed the frost or humidity on the grass, and continue there till sun-set. It is also sufficient for them in these seasons, to drink once a day, just before they are brought back to the sheep-house, where they must always find fodder, though in less quantity than in winter. It is only in summer that they are to live entirely on the pastures, whither they are led twice a day, and also made to drink twice. They are led out very early in the morning to feed as soon as the dew is down, where they continue four or five hours; after which, and being had to the water, they are brought back to the fold, sheep-house, or some other shady place: about three or four o'clock, when the extreme heat begins to abate, they are a second time led to the pasture, where they continue till the evening; and were it not for the fear of wolves, they should pass the night in the open air, as they do in England, which would render them more vigorous, clean, and healthy. As too great a heat is remarkably troublesome, and the violence of the sun-beams disorders their heads, and throws them into vertigo's, it is proper to make choice of places shaded from the sun, and in the morning to lead them on eminences exposed to the east, and in the afternoon on those that are exposed to the west, that when they are feeding, their heads may be in the shadow of their body. Lastly, in order to save their wool, they must not be led through any bushy places.

"In dry and high grounds, especially if the herbage abound in wild thyme, and other odoriferous plants, the mutton is of a much finer quality than that which is fed in moist vallies and low plains; unless these plains be sandy and near the sea, the herbage then being sprinkled with salt; and the sheep are no-where so good as on these salt plains. The ewes also fed in them, yield more milk, and of a better taste. These animals are remarkably fond of salt, and nothing is more healthful when given in moderation; and in some places it is customary to put into the sheep-house a bag of salt, or a saline stone, which they all greedily lick one after another.

"Every year the flock should be examined, in order to find out such as begin to grow old, and are intended for fattening; for as they require a different management from the others, so they should also be formed into a separate flock. They should be led abroad in summer before sun-rising, in order to feed on the grass while moistened with the dew. Nothing forwards the fattening of weathers more than a great quantity of moisture; and nothing more obstructs it than the heat of the sun; so that about eight or nine in the morning, before the great heat begins, they should be brought back, and salt given them to excite thirst. About four in the afternoon they should be led a second time into cool and moist places; and after two or three months of these little cares, they will have all the appearance of being full of flesh: indeed they are generally fattened as much as they can be; but this fat proceeding only from the great quantity of water they have drank, may be said to be no more than an œdema, or bloated humour, which would in a short time turn to the rot, and can be prevented only by killing them while in this state of fatness. Even their flesh, far from being firm and juicy, is extremely insipid and flabby: in order, therefore, to make good flesh, besides letting them feed on the dew, and giving them a great deal of water, they should have, at the same time, more succulent food than grass. They may be fattened in every season, by only keeping them a-part in a sheep-house, and feeding them with the meal of barley, oats, wheat, beans, &c. mixed with salt, for making them drink more copiously. But in whatever manner, and in whatever season they are fattened, they must be immediately disposed of; for they cannot be fattened twice, and they will die by diseases of the liver.

"Worms are often found in the livers of animals; and a description of those found in the liver of sheep and oxen, may be seen in the journal de Scavans, for the year 1668, and Ephemerides of Germany, tom. v. 1675, 1676. These worms were thought to be peculiar to ruminant animals; but M. Daubenton has found the very same in the liver of the ass; and it is probable the like may be found in the liver of other animals: but it is also affirmed, that moths have been found in the liver of sheep." M. Rouille, secretary of state for foreign affairs, was so kind as to communicate to me a letter to him, from a doctor of physic at Montiers, in the duchy of Taranteisie in Savoy, from whence I have made the following extract. "It has for a long time been observed, that the sheep of our Alps, which are the best in all Europe, sometimes fall away surprizingly. Their eyes become white, sunk, and blared; their blood serous, with scarce any redness to be seen in it; their tongue dry and shrivelled; their nose stuffed with a yellow,

yellow, viſcid and putrid mucus; an extreme debility, though they eat a great deal; and, in fine, the whole animal ſyſtem viſibly decaying. After ſeveral cloſe enquiries, theſe animals were found to have in their liver white papilios, with proper wings; their heads of a ſemi-oval form, bilous, and of the bigneſs of thoſe belonging to the ſilk-worm. I have been convinced of the reality of this fact, by ſqueezing above ſeventy out of the two lobes; and, at the ſame time, all the convex part of the liver became lacerated. They have been found in the veins only, without a ſingle inſtance of their being in the arteries. In the cyſtic duct ſmall ones have been found, together with ſmall maggots. The vena porta, and the capſula of Douglas, which are viſible there as in man, yielded to the ſofteſt touch. The lungs and other viſcera were ſound." It were to be wiſhed that the doctor had given us a more circumſtantial deſcription of theſe papilios; that theſe animals which he ſaw may not be ſuſpected to be no other than the common worms found in the liver of a ſheep, which are very flat and broad, and of ſo ſingular a figure, that they would rather be taken for leaves than worms.

" Every year the whole flock, weathers, ewes and lambs, are ſheared. In hot countries, where the creature may without danger be laid bare, the wool is not ſheared, but plucked off; and often they yield two fleeces in a year. In France, and the colder climates, it is cut only once a year with large ſhears, ſtill leaving the ſheep part of their fleece, as ſome defence againſt the ſeverity of the climate. The ſeaſon for this operation is in the month of May, after thoroughly waſhing them, that the wool may be as clean as poſſible. In the month of April it is too cold, and if delayed till June or July, the wool would not grow ſufficiently during the remainder of the ſummer, to ſecure them from the winter's cold. The weathers have generally more wool than the ewes, and it is alſo better. That of the neck, and the top of the back is the prime; that of the thighs, tail, belly, throat, &c. is not ſo good; and the worſt is that taken from dead beaſts, or ſuch as are ſick. White wool is alſo preferred to the grey, brown, and black, as it may be dyed of any colour. Strait wool is better than curled; and it is even ſaid that the weathers whoſe wool is too much curled, are not in ſo good a ſtate of health as the others. A conſiderable advantage may alſo be drawn from ſheep by folding them; that is, by leaving them for a proper time on lands intended for improvement. In order to this, the ground muſt be incloſed, and the flock ſhut up in it every night during the ſummer. By this means the dung, urine, and heat of the body of theſe creatures, will in a ſhort time bring the ground into heart, whether exhauſted, or naturally cold and barren. A hundred ſheep will in one ſummer meliorate eight acres of ground, which will continue its fertility ſix years.

" We are told by the ancients, that all ruminant animals have ſuet, though this is ſtrictly true only of the goat and ſheep; and that of the ſheep is in greater quantity, whiter, drier, finer, and of a better quality than any other. Fat differs from ſuet, as continuing always ſoft; whereas ſuet hardens as it grows cold. It is chiefly about the kidneys that the ſuet is found; and the left has always more of it than the right. There is alſo a great deal of it in the caul, and about the inteſtines; but this ſuet is far leſs firm and good than that of the kidneys, the tail, and other parts of the body. Weathers have no other fat than ſuet; and ſo predominant is this fat in their conſtitution, that all the extremities of their fleſh are covered with it. Their very blood is not without it; and the ſeminal lymph is ſo ſaturated with it, as to appear of a different conſiſtence from that of other animals. The lymph of the human ſpecies, that of the dog, the horſe, the aſs, and probably of all animals without ſuet, liquifies by cold, rarifies in the air, and becomes the more fluid from the time it was ejected from the animal's body. On the contrary, the ſeminal liquor of the ram, as well as that of the goat, and probably other animals that have ſuet, inſtead of rarifying in the air, hardens like ſuet, and, with its heat, loſes all its liquidity. This difference I have perceived by microſcopical obſervations on theſe ſeminal lymphs. That of the ram coagulates in a few ſeconds after its leaving the body, and to perceive the living organical moleculæ, of which it contains a prodigious quantity, the object plate muſt be heated, in order to preſerve it in a ſtate of fluidity.

" The taſte of the fleſh, the fineneſs of the wool, the quantity of the ſuet, and even the ſize of theſe animals, differs very greatly in different countries. In France they chiefly abound in the duchy of Berry; thoſe in the neighbourhood of Beauvais, and ſome other parts of Normandy, are the largeſt, and the fulleſt of ſuet. In Burgundy they are very good; but the beſt are thoſe that feed on the ſandy coaſts of our maritime provinces. The wools of Italy, Spain, and England, are finer than thoſe of France. In Poitou, Provence, the neighbourhood of Bayonne, and ſome other parts of France, there are ſheep which ſeem to be of a foreign breed; they are ſtronger, larger, and have a great deal more wool than thoſe of the common breed. Theſe ſheep are alſo more prolific than the other, it being nothing extraordinary with them to have two lambs at a time, and yean twice a year. The rams of this breed, engendering with the common ewes, produce an intermediate breed, partaking of the two from whom it proceeds. In Italy and Spain, the number and variety in the breeds of ſheep is ſtill greater; but all muſt be conſidered as forming one and the ſame ſpecies with our ſheep; tho' this ſo numerous and diverſified ſpecies hardly extends beyond Europe. Thoſe long and broad tailed creatures ſo common in Africa and Aſia, and by travellers called Barbary ſheep, ſeem to be of a ſpecies different from ours, as well as the American, Vigonia, and Llama.

" White wool being much more eſteemed than black, ſpotted or black lambs are almoſt every where ſold to the butcher; though in ſome places the far greater part of the ſheep are black; and for black lambs to be produced by a white ram and ewe, is a phænomenon common in every country. In France there are only white, brown, black, and ſpotted ſheep; Spain has dun ſheep; in Scotland there are yellow; but all theſe differences and varieties in the colour are no more fortuitous than the differences and varieties of the breeds, which are, however, wholly owing to the effects of the food, and the difference of the climate." *Buffon's Hiſtoire Naturelle, tom.* v.

The reader is indebted to the ingenious Mr. Irwin for the following obſervations relating to the management of ſheep in Ireland.

" Of all the quadrupeds, ſays he, the ſheep perhaps is the animal beſt adapted by Providence to pay the rent. It requires great attention to it; but, at the ſame time, little bodily trouble. The chief care ſhould conſiſt in their cantonment for food, in which our Iriſh farmers are extremely negligent (I mean thoſe of them that have abilities to be otherwiſe); for they ſtation them promiſcuouſly over the land, encloſing only the fattening grounds, which is done but badly, and other cattle ſuffered to mix with them; whereas ſheep, in their rearing and fattening ſtate, ſhould be by no means ſuffered to perambulate a variety of paſture. For this reaſon,

" Moſt cloſes, or encloſed fields, have ſome herbage, beſides the common graſs, predominant in them; and where ſheep are ſuffered to run over too many of theſe at once, the different mixtures in ſuch extenſive paſtures have, I am convinced, from repeated experimental obſervations, very unfavourable effects on this tender and delicate animal, both as to rearing and fattening, or as to bone and growth.

" It actually gives, or inclines them to a ſcower (and other diſorders well known to the ſhepherds) oftentimes not leſs prejudicial than that which they never fail getting in low ſwampy grounds, which always proves mortal to ſheep that are ſuffered to remain ever ſo ſhort a time in ſuch places; for though the noxious inſane effects of ſuch paſture may not immediately appear, or operate on them, it never fails bringing on the rot in the end, which manifeſts itſelf by the ſcower, and other unhealthful ſymptoms.

" A gentleman in my neighbourhood, who occupies ſeveral thouſand acres of deep, rich ſoil, ſuffered a conſiderable loſs of ſheep, particularly ewes, in the ſpring of 1759, (I think it was) and that ſeaſon was far from being inclement, eſpecially wet, which is the moſt unfavourable weather to that kind of ſtock.

" I made cloſe enquiry into the cauſes of this uncommon mortality, for ſuch it appeared to me at that time.

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"The common reasons for this destructive pestilence were indeed given; but from some observations I made from appearances, I did not judge them satisfactory.

"It seemed to me that a too extensive run of over fertile, luxuriant soil, little or no shelter, negligence in folding, and other care not difficult to be taken, but absolutely necessary to the well being of this delicate animal, had brought on a deadly and general rot.

"Many were with difficulty saved, only to languish away, in all probability, the succeeding winter; for though a sheep, the first time it is tainted with the rot, whether in winter or summer, may for that season, with great care and difficulty, be preserved, it nevertheless seldom happens that any amelioration of pasture will make it a long liver; for when it is once touched with this disorder, a cure may (as in many human chronical diseases) be patched up; but it will never get thoroughly clear of it. Hence the generality of our farmers, though they may think otherwise from their practice, appear to me to be in great error in this respect.

"But their stock is commonly too large, and they are continually buying in, or selling out; so that by not keeping them for any length of time they have not proper opportunities to explore rightly the effects of the causes we are now investigating.

"The largeness of their stock, I say, prevents them from looking minutely into these necessary matters, which is not in general the case in England. Besides, from the great numbers they oftentimes possess, they are so accustomed to losses in this way, and so little attendant to physical causes, that they are things of course with them; neglects I call them, that a little attention would easily remedy, were the flocks never so large: and in this respect indeed it must be admitted, custom erroneously commits too many to the care of one shepherd in a country not yet thoroughly improved.

"Through the laziness or inattention of the herd (for careless they almost all are) many casualties they pretend arise from the unimproved state of the farm, and easily impose them as such on their employers, whereas they solely proceed from their own neglect.

"To remove sheep often is an excellent temporary preventative against the rot, and most other disorders incident to them; but to fold them dry a-nights is still more infallible; that is, to keep them from rain; but the largeness of the flocks in Ireland, most people imagine, is an absolute bar against this salutary expedient.

"This is an ill-founded surmize. If they would divide their stock into smaller proportions, that is, to limit their sheep-walks to one or two hundred acres at most, under the care of one man; to allow to these proportions (the land being, we will suppose, of no more than a middling good sort) three sheep *per* acre in summer, and one and a half in winter, in the rearing or breeding way; and to erect on every such farm proportionable shelter-houses to a south, or south-by-east aspect, (but never to the north or west, the winds blowing, especially from the latter point, too long and cold) there would not be one third of the annual dearth of sheep there is; and in this computation I fancy the proportion is exceeded.

"Those who hold very extensive tracts, may say this simple expedient is not practicable; but it certainly is, both to the considerable and inconsiderable farmer, even in parts where timber is not easily had, which seems to be the chief difficulty. Suppose now (to give a very feasible hint) a house made of turf (if no stone or brick could be conveniently had) one hundred feet long, about fourteen wide, and the wall about five feet high, with four large doors or openings to the aspects before mentioned; slight and cheap timber girthing, easily carried from afar, would do for this business as well as the best; the thatch, whether straw out of the barn, or stubble, which last is far the best, we know, is of trifling value in those parts, and ought to be well sowed on with ropes, which makes it effectually resist stormy weather; and the erecting the wall of turf, or, which is much better, with clay-mortar, well mixed with straw-rubbish, we also know; cannot cost much, where labour is but from a groat to six-pence a day.

"In short, I could erect one of these houses in this manner on every hundred acres, which is the quantity of land that ought to be allowed to each, for fifteen pounds, Irish money, or, at most, twenty. The land, spoiled by digging off the sods, would be soon restored by the treading of the sheep. The hay-yard, of course, to be adjoining this house.

"All the objection I think can be made is, the not being able to move these houses, thereby to ameliorate different spots of the farm, as they do in Switzerland their wooden houses that run on wheels.

"Conveniencies in countries are different: in Switzerland there is plenty of wood; in many parts of Ireland the length and difficulty of carriage renders a sufficiency of it for this purpose impossible to be had: besides, moving houses, for aught I know, may do well in Switzerland, or in England; but such as I mention would answer extremely well in Ireland.

"In this way I am sensible the winter-mucking would be almost always on one spot; but it would make much dung, which might be removed to great advantage; and if it had not, is it not evident that it would be much more beneficial to lose the night-mucking, during the three or four most inclement months of the year, than treble the worth of it of one's stock? Moreover, I am not clear, but the dung being preserved from the frost would go farther than if scattered by the sheep about the land in hard weather: and, though it is much the custom to turn out dung in that season, I am certain, (and many physical causes will demonstrate it) the sooner afterwards it is mixed with the land, the more of its virtue it will retain.

"But before I quit the article of sheep: as I said before, countries and circumstances differ; for though I do not approve of extensive unenclosed pastures in Ireland, it seems in Spain they do well enough: the flocks there are small, as in France; but they have a right of commonage in that country, perhaps not in any other civilized one that we know of.

"There it is a constant practice with the shepherds, soon after shearing time, to set out with their flocks, generally consisting of about an hundred each, and to pass from one province to another, feeding them promiscuously both on ley and corn lands, the meadows, and some other particular enclosed lands, as parks belonging to the nobility, and clergy especially, only excepted.

"These itinerant shepherds often travel three or four hundred miles from their habitation with their small flock: they sometimes take part of their family, a good deal of provisions, a tent, and some well-trained dogs, and are never stopped if they keep their sheep on the open lands, and often do not return home till after lambing-time.

"They generally have one third, or half the profit of the flock for their hire." *Museum Rusticum, vol.* I. *pag.* 449.

"I think, says another writer in the Museum Rusticum, that early shearing should be preferred on many accounts: some defer this work till at or after Midsummer; but this should be avoided as very bad consequences often ensue. By this late shearing, the maggot has an opportunity of breeding in their skins; and this frets them in such a manner, that they often pine away, and lose all their flesh.

"This is easily prevented by early shearing; and, therefore if the weather be any thing tolerable, I generally do this work about the middle of May, and sometimes the beginning of that month: by this method the new growth of the wool has time to get a-head, so as to secure the sheep from the attack of the fly. It is true, that at this time of the year the weather is often cold, and chilling rains fall, which might endanger my new-shorn sheep, was no farther care taken of them: but this danger I always guard against, by washing my sheep, after shearing, with salt-water taken from the Medway: this is of great service in killing any vermin that may harbour close to their skins; and, besides this advantage, the penetrating quality of the salt so warms this animal's mass of blood, that it is a great means of preserving it from many disorders to which it is fatally subject; such as the gripes, scab, red-water, rot, &c. &c. &c. This, I say, has been my practice ever since I have lived in Kent; but before that time, when I was not within distance of the sea or Medway, to get salt-water from thence, I always made a brine of a proper strength with common salt and soft water, and applied it to the same use with equal benefit, though it cost

me,

me, to be ſure, ſomewhat more. When my ſheep have ſores, either by the bite of flies, or by ſcratching, &c. I find the beſt remedy to be that which is commonly in uſe, viz. a little tar applied to the wound: many, if you aſk their advice, will, by way of ſhewing their judgment, preſcribe to you complicated mixtures, which have no other merit but being more expenſive: but be aſſured, the more ſimple the remedy, the ſpeedier the cure.

"Many farmers ſuffer great loſſes by buying ſheep that are rotten; for which reaſon, every prudent man ſhould, when he buys a lot of ſheep, agree with the ſeller, that he ſhall warrant them ſound for a month at leaſt: this would prevent many heavy loſſes, and be a means of guarding honeſt men from being impoſed on. If ſheep are the leaſt inclinable to the rot, the beſt remedy is to drive them directly into a dry upland paſture.

"Though I ſhear my ſheep ſooner than moſt of my neighbours, I ſhould alſo have obſerved, that I always ſhear my fat weathers firſt, as they are beſt able to bear the cold; and I reſerve my poor ſheep till laſt, as the cold and chilling rains pinch them more than the others." *Muſeum Ruſticum, vol.* I. *page* 210.

I never uſed, ſays Mr. Liſle, "to ſhear till the Monday before Midſummer-day; but I now (anno 1714) find I was in an error in ſo doing; and that, as my keeping is very good, by which means the wool grows the larger, and heats the ſheep the more, and their fleſhineſs being ſuch as to bear the cold the earlier in parting with their fleeces, I ought to begin to ſhear the firſt week in June; and the ſheep would not only thrive much the better, when the load of their wool was gone, but their new wool would alſo have more time to grow againſt Wayhill fair, which would make the ſheep look more burly." *Liſle's Huſbandry, vol.* II. *pag.* 275.

We cannot but in general approve of the early ſhearing of ſheep, beginning with the fatteſt; but no certain day can, with reaſon, be fixed for doing this work; for our ſeaſons differ ſo much in various years, that next year, in the beginning of May, the weather may be ſo warm as to be very proper for the work; and in the following year, the middle of the ſame month may, on account of the cold, be too ſoon to begin. The beſt regulator for this work, as well as many others, would be the ſtate of vegetation, from repeated obſervation of ſome particular tree or plant, on a particular ſoil and expoſure; for to bring plants to a certain ſtate, requires always a certain degree of heat, and this is ſooner or later, according to the ſeaſon. Every work of huſbandry, in ſpring at leaſt, might be regulated in the ſame manner, and that to great advantage, for nature is an unerring guide.

The ſheep of the Ardennes, a foreſt in Lower Germany, are every where celebrated for the exquiſite delicacy of their fleſh; and, from a particular method of ſhearing them, their wool alſo is in no leſs eſteem.

"Amidſt all the accidents and diſtempers to which ſheep are liable, ſeldom any of them are known to die, certain innocent remedies ſoon reſtoring them. I have obſerved, every where elſe there is a fixed ſeaſon for ſhearing ſheep; and accordingly I have ſeen not a few, after being ſhorn, ſhivering with the ſharpneſs of the air; whereas, in the Ardennes, if the month of April or May be too hot or too cold, the ſhearing is delayed; and it is not often they ſet about it before the middle of ſummer. If, when bared, they are found to have received any wound in the ſhearing, it is rubbed over with a liquid pitch, and all the reſt of the body well waſhed with wine or oil.

"In ſome part of the Ardennes, the wine is mixed with oil-lees, or an ointment is made of wine, oil, and virgin-wax; and this precaution is ſaid not only to thicken their wool, but alſo preſerves them from ſores and the ſcab. They are never ſheared in the morning, it being a proverb in the country, that wool is to be ſheared, as fruits deſigned for keeping are to be gathered, when the dew and coolneſs have been exhaled by the heat of the ſun. If ſheep are ſheared when ſweating, the wool, by imbibing the ſweat, becomes the ſofter and better coloured.

"Sheep are ſubject to a kind of diſtemper, which, within two or three weeks, frequently ſweeps away a whole flock; but, to prevent ſuch a fatality, the Ardennes ſheep, at the beginning of the ſpring, have a certain potion given them.

"The flock is firſt carefully examined, and the ailing ſheep ſeparated from the ſound; an excellent method! yet is the Ardennes the only place where I ever ſaw it practiſed: after this, the juice of wild ſage and hore-hound, well cleanſed, is mixed in their drink, and this continued for a fortnight ſucceſſively. In autumn this medicament is repeated; and thoſe which are ſick likewiſe go through the ſame courſe during a fortnight, and generally with a very happy effect.

"Upon being ſeized with the ſcab, which the negligence of the ſhepherds does but too often occaſion, an ointment is prepared for them of the juice of any kind of ſage, mixed up to a conſiſtency with pulveriſed ceruſs and freſh butter: with this the ſheep are rubbed, and, three days after, waſhed with the urine of a ſhe-aſs, which cures them.

"If the exceſſive heats have ſo affected them, that they grow ſickly and faint, and even to a total loſs of appetite, the juice of wild beets is mixed in their drink, and endeavours are uſed that they ſhould eat them, which if they can be brought to, they are the ſooner upon their legs; but if any aſthmatic ſymptoms appear in the ſheep, the tip of their ears is cut off, after which the paunch of a ſheep being thoroughly boiled in wine, a ſpoonful of the liquor is given to every ſheep; and this never fails, in a very little time, to ſet them to rights.

"The cough is ſo common a diſorder among ſheep, that one ſeldom paſſes near a flock without hearing it in ſeveral: yet in the Ardennes it is otherwiſe; for upon their firſt coughing, a radical cure is wrought by ſyringing, during ſix or eight days, up the ſheep's noſtrils, blanched almonds pounded in wine.

"It ſometimes happens that ſheep feed in paſtures intermixed with noxious herbs, which not ſeldom occaſion their belly to ſwell; and this, without a ſpeedy remedy, proves fatal; but, upon the firſt appearance of it, they are bled in the lip, and a ſpoonful of man's urine adminiſtered to them, which makes a perfect cure.

"If along with the graſs they have eat any worms or leaches, olive-oil, mixed with warm vinegar, is poured down their throats: this not only cures them of the preſent evil, but preſerves them from ſeveral other accidents.

"An abſceſs, or impoſthume, in the ſheep, is cut, and ſalt, well pulverized and burnt with liquid pitch, ſtrewed over the inciſions.

"In order to make the ſheep good nurſes, ſo that they may be able plentifully to ſuckle two lambs, all they do is to bind dittany (in ſome places called pepper-wort) and trefoil to their bellies.

"Upon the lambs being ſick, a few ivy-leaves are given them to eat, which after a week ſo well reſtore them, that they ſuck very vigorouſly." *Muſeum Ruſticum, vol.* IV. *pag.* 420.

"There are, ſays Mr. Mills, in this kingdom, vaſt tracts of ground, known by the name of downs, on which are chiefly fed large flocks of ſheep. Experience has abundantly evinced, that though the graſs there is naturally ſhort, it is an excellent food for ſheep; and as the welfare of theſe creatures is of the utmoſt conſequence to one of the moſt eſſential branches of the commerce of England, very great caution ſhould be uſed in making any alteration in their diet, till it be well proved, by fair experiments, that a richer paſture does not injure their fleeces. I would therefore recommend, in the ſtrongeſt manner, to gentlemen who have eſtates bordering on ſuch downs, particularly on that extenſive tract called Saliſbury Plain, which reaches from the weſtward of Malborough to the ſea, to bring ſome of their ſheep into rich paſtures, of different graſſes, as well natural as artificial, and to keep them there for ſome generations, in order to aſcertain with certainty, what the effect will be.—The word generations, may, perhaps, here terrify at firſt, as implying a long ſpace of time for theſe experiments, thoſe who do not immediately conſider in how few years this ſucceſſion may take place.—A lamb reared from its birth on, for inſtance, burnet, will, in two years, bring a lamb, which, in two years more, brings young, and the ſixth year may ſee the third generation: ſo that by the end of ſeven or eight years the fact may be aſcertained.

"If sheep will be equally benefited by richer pasture, then the farther improvement of these downs must become a matter of great concern, both to individuals and to the public; because, granting that they may be improved with safety, the number of our sheep may be greatly increased: but if such improvement shall be found in the least detrimental to their wool, instead of being encouraged, it should be forbidden, even by law." *Mills's Husbandy, vol.* III. *pag.* 379.

SHEEP's-DUNG. *See the article* DUNG.

SHEEP's- *fescue-grass.* *See the article* GRASS.

SHEEP-LEASE, *Sheep-slate*, or *Sheep-walk*, pasture-land, appointed to the feeding of sheep.

SHEER, pure, clean, unmixed.

SHELLS, a hard, and as it were stony-covering, with which certain animals are defended, and thence called shell-fish.

The vast beds of fossile shells found at great depths in the earth, as well as those found lying on the sea-shore, make an excellent manure for cold clayey lands. *See the article* CLAY.

SHEPHERD's-*Needle*, the name of a plant, so called from the remarkable shape of the seeds, with their appendage, resembling the crane's bill.

SHIPPEN, a cow-house.

SHOEING *of horses*, the operation of fastening a piece of iron on the bottom part of a horse's hoof.

The affair of shoeing horses, is so important in its consequences, both for the preservation of the foot, the safety of the legs, and the ease of their motion, that we cannot be too attentive to any innovations, that may be recommended to us in this respect; we shall therefore give Mr. La Fosse's sentiments on this subject, with such animadversions as have occurred to us.

In order to understand this new method of shoeing, it is necessary first to premise the following observations, and attend to the anatomical plates before referred to.

It is most certain, that all horses, except such as have their feet overgrown, or such as may have a particular occasion of being shod, to preserve the sole, may, at any rate, go without shoes; and there are many examples, without mentioning the customs of Arabia, or Tartary, of horses who are at daily work, without the least need of ever being shod: but as we employ all our care, and address, to hollow the foot, by paring it even to the quick, and to form an exact fine frog, it becomes absolutely necessary to set shoes on them.

The original design of shoeing horses, was undoubtedly intended as a preservative of the hoof, and a defence of the sole; but no one sure could think it necessary to pare away, what he wanted to preserve by the use of the shoes; because that would be to act contrary to his first principles, and destroy his own work.

This precaution could never be recommended, but in cases where the horny sole is uneven, insomuch, that the shoe could not bear equally upon it, which would take off from its necessary firmness; in such a case, it may be reasonable, otherwise it would be very absurd.

Let us now observe the going, as well as the external, and internal structure of a horse's foot.

The horse then who draws, presses first on the toe, then successively on the sides, to ease the toe; then the horse's heel yields upon the heel of the shoe, from which it immediately rises again.

The saddle, or pack-horse, places the toe but lightly, so that the point of support, is fixed neither upon the heel, or toe, but between both; which it is easy to demonstrate anatomically.

Thus the cannon-bone presses on the pastern, this on the coronary, the coronary upon the coffin, or foot-bone, and upon the nut-bone.

By this description of the bones, we may observe two essential things, which lay open the faults in the present method of shoeing, and point out the means of being able to remedy them for the future; one is, that the effort of the weight of a horse, does not bear, either upon the toe, or heel, but on the middle, between both; the other shews, the greater the distance of the sole from the ground, or from whatsoever point of support, the more the pushing the coronary-bone upon the nut-bone, will fatigue the nerve, or tendon upon which it rests, by the inordinate distension it undergoes at every step the horse takes.

Thus we see, that by hollowing away the sole in paring, the horse is sustained only upon the walls of the hoof, which having no assistance of support from the horny sole, is immediately worn, and battered by the weight of the horse's body; and the sooner he treads upon any hard substance, the sooner he grows quite lame.

For by the connection, thickness, and flexibility, as well as contexture of the horny sole, it seems to be wholly destined by nature, to serve, as a cushion to the fleshy sole, and tendon, which rests upon it, in order to break the violent shocks of a pavement, stone, or any kind of stump, or external violence; but by paring it away in the customary manner, the horse loses his defence of nature, against stumps, nails, glass, &c. and thus the fleshy sole becomes easily bruised, or wounded.

It is observable, that a horse seldom goes easy, or escapes being soon jaded, if the frog does not bear upon the ground, as it is the only point of support to the tendon; so that if you keep it at any distance from the ground, by paring it away, an inordinate distension will happen to the tendon; which being repeated at every step he goes, fatigues it, and causes an inflammation; whence also relaxations, defluxions, and tendinous swellings, especially after long journeys, or hard riding, which are occasioned more by the paring of the sole, than the length of the journey; experience has shewn, that the frog neither suffers, or has shewn the least sign of fatigue, or sensibility, by being thus exposed; and indeed from the structure of it, it is scarce possible; for being of a soft spongy flexible substance, by its natural elasticity, it yields to the weight of the body, the instant the horse presses his feet to the ground, and immediately recovers it again; however, there is one case, whereby the frog may occasion lameness, which is when it grows hard or dry; but by taking off the little end of the frog, this disorder is soon remedied.

As the bad consequences of paring away the sole and frog, have been pointed out, and, I think, evidently proved, let us observe now, the ill effects of modern shoeing; for it is upon the form of the shoes, and manner of setting them on, that not only the preservation of the foot, but also the safety of their legs, and the ease of their motion depends.

In effect, the more easy our shoes set upon us, the more active we are; so a large, long, thick shoe ought to have the same effect upon horses, that wooden shoes have upon us; that is, make them heavy, unweildy, and hobling.

A long shoe is not only perfectly useless, but it is even prejudicial; for the horse's heels coming to sink upon those of the shoes, the longer the lever, the greater will be the drag upon the clinches of the nails of the toe; and thus horses will be more apt to strike them off on many occasions; especially when they are apt to over-reach.

The longer the shoe is, and the more it covers the sole, the more liable the horse will be to fall, trip, and hobble in his walk; particularly if he goes on a pavement; because the surface being formed of round parts, and the shoe having a large uniform hard face, he can scarce have above two or three points of support.

It is thought by some, that strong shoe-heels are an ease to the weak heels, and fetlocks of horses; as if the body of the shoe was flexible enough to yield to the horse's heel; and under this notion, they raise the shoe-heel, and leave a vacant space between that and the horse's heel; but the direct contrary happens, for it is the hoof, that by its flexibility yields to the shoe-heel, which is quite inflexible: the thicker the shoe-heel is, the more subject that of the horse is to meet it, and instead of being eased, the horse's heel becomes more compressed, as if in a constant vice, because it has always the same point of support.

By this means, they deprive them of the liberty of going with ease upon a pavement; because the shoe does not bear upon a level, and produces an effect, like that of a pivot, upon the middle of the shoe-heels, and the vault, or hollow.

To obviate these inconveniencies, M. La Fosse proposes the following method of shoeing; that neither the sole, or frog should be pared at all; for neither will ever become too large by its growth; but in proportion as it grows, it will

will dry, fcale, and fall off in flakes; that the edge of the hoof, if thought too long, fhould be taken down as ufual; and then a fhoe, in form of a half moon, fet on, reaching the middle of the hoof; the heels may be thinned, and the fhoes made a little longer for fuch horfes as have weak hoofs.

Eight fmall nails, made in the old way, that is, having very fmall heads, are incrufted in the holes, which are made, as the head is, in an oblong form; the figures both of the fhoe and nail, are to be feen in the plate. This is the whole myftery.

By this method, the fole is preferved, and confequently the foot defended againft hard, or fharp bodies, which the horfe may chance to tread on; thus inflammations, and dangerous compreffions are avoided, and the many inconveniencies already mentioned, from the lodgment of fand, gravel, or ftones.

Another advantage arifing from this method of fhoeing, and preferving the fole, that natural defence againft external injuries, is, that in not paring away the fole, nor fetting on any more fhoe than is neceffary to preferve the horny fole; the horfe will not be fubject to flip, either on the winter's icey pavement, or the dry fmooth one of the fummer.

For by making a horfe walk upon the frog, and partly upon the heel, the former being ftrongly rubbed, and pufhed againft the ground, or pavement, impreffes itfelf, as it were, by the weight of the horfe's body, into the inequalities, and interftices it happens to meet in its way; by this means, the foot refting on a great many more parts, which mutually eafe it, by multiplying the points of fupport, gives the animal a ftronger adherence, and more fecurity upon the place he goes.

By paring away the fole, the air when it is in this thin ftate, penetrates, and dries it to fuch a degree, that by its contraction, it compreffes the flefhy fole, fo as to lame the horfe.

By this means, alfo fand, and gravel get in, and are ground between the fole, and fhoe; and again between the horfe's heel, and thofe of the fhoe; which not readily coming out again, caufe compreffions, inflammations, &c. which laft accidents are very often the effects of a ftone's being wedged in between the fhoe-heels.

To recapitulate the whole.

The weight of the faddle horfe, does not prefs upon the toe, or heel, but on the middle between both; fo that the greater the diftance of the fole from the ground, or from whatever point of fupport, the more the great tendon will be fatigued, by the inordinate diftention it undergoes at every ftep.

The more the fole is covered by the fhoe, the more the horfe will flip, flide, or fall; becaufe the furface being formed of round parts, and the fhoe having a large uniform hard face, he can fcarce have above two or three points of fupport; fo that the greater contact the horfe's foot has with the ground, the more points are multiplied; and the fafer of confequence he goes.

By fhoeing, no other intention could be expected, but preferving the hoof, after paring away its luxuriancy.

That long fhoes, and raifing the fhoe-heel, is a very pernicious cuftom.

By paring away the horny fole, it hardens in proportion to its being thinned, and by compreffing the flefhy fole, makes a horfe lame; he lofes alfo the defence of nature againft external bodies, by which means, the flefhy fole becomes often wounded, bruifed, &c.

By paring the frog fo much away, that it is not in contact with the ground, the tendon will be inordinately diftended: by which means, it becomes fubject to inflammation, relaxation, defluxion, and rupture.

Laftly, It appears from the anatomy of the foot, that horfes are chiefly lame in thofe bones and its tendon; that the prefent method of fhoeing contributes greatly thereto, by paring away the horney fole, and hollowing the foot; by which means, the flefhy fole becomes more expofed to accidents, and the tendon fatigued, ftrained, and ruptured; its fupport being taken away by paring the frog.

We may learn alfo from hence, that no more of the toe fhould be pared away, than to keep the foot uniform with the fhoe; that the fhoe fhould be made flat, in order to adapt itfelf the better to the foot; not made too thick, or hollow, nor projecting beyond the horfe's heel.

This is the fubftance of M. La Foffe's new method of fhoeing; which from its fimplicity, and the great eafe of performing it, feems to demand our regard and attention: but though it appears well calculated for the flat pavements, and roads of France, yet we doubt its general fuccefs with us; efpecially in fome of our rough ftony countries, where the heel, and frog, being left fo intirely defencelefs, might be liable to frequent injuries from fuch irregular loofe bodies, as flints, loofe ftones, &c. We fhould fufpect alfo its fuccefs, on moift, greafy, and flippery foils, or chalks; where the fhoe heel, or cramps, feems of great ufe, to fupport a horfe, by the impreffion it makes in the furface; how inconvenient foever it may be in other refpects; tho' it muft be confeffed, from our method of fhoeing race horfes, where the whole foot comes into immediate contact with the ground, notwithftanding the courfe they run over is often very flippery, yet they feldom fall.

But though this method may not be fo generally adopted by us, in its utmoft extent, for the reafons above given; as well as from the different texture of horfes feet, which in fome will always demand a particular method of fhoeing; yet it undoubtedly may fuit many horfes, and many different parts of the kingdom; and this particular advantage every one may reap from it, viz. to pare away as little of the fole and frog as poffible, even in the old method of fhoeing: the many inconveniencies of which, we apprehend, have been fufficiently pointed out, and amply explained; and would by this means, be in a great meafure obviated.

EXPLANATION of Fig. 1, 2, 3, 4, Plate XXIV.

Fig. 1. reprefents the bottom of a horfe's foot.

a. a. a. is the horny fole.

b. the frog.

2. The hoof towards its lower edge, called by the author the wall of the foot.

Fig. 2. fhews the horny fole *a.* raifed from the flefhy fole *c. c. c.* round which is the enchannelled flefh, 6. placed in the fulcus of the inner furface of the hoof: 5. the horny part of which is foft and white.

Fig. 3. reprefents the under part of the flefhy fole *c.* raifed from the foot-bone, or what Gibfon calls the coffin-bone *d. d. d.* *g.* the covering or fheath of the Tendo Achillis. 2. The cartilage. 6. The edge of the flefhy fole confined in the furrow of the channelled horny fubftance. *Bartlet's Farriery, pag.* 352.

SHOODS, oat hulls.

SHOVEL, a well-known inftrument, confifting of a long handle, and a broad blade, with raifed edges.

SHOWEL, a blind for a cow's eyes.

SHROUD, a fhelter, or harbour.

SHUCK, a hufk or fhell.

SICKLE, a toothed hook, with which corn is reaped.

SIEVE, hair, lawn, or bafket-work, ftrained on a hoop, for feparating the flour from the bran, the duft from corn, &c.

SIG, urine, chamber-lie.

SIKE, a little rill, a water furrow, a gutter.

SILK, an extremely foft and gloffy thread, fpun by a fmall animal called a filk-worm.

It has long been a difpute whether filk can or can not be produced to advantage in England; we fhall therefore lay before our readers the following account, which we hope will not prove difagreeable.

"Could filk be produced in England fo as to furnifh the whole, or great part of what we now confume, it would, perhaps, be more advantageous to the community, than any other fubject whatever, of produce or manufacture. And there is great reafon to believe, as well from the authority of the beft judges, as from conclufions drawn from the circumftances of the thing itfelf, that it is far from being impracticable.

"As the production of filk at home does not, however, feem to be attended to at prefent, in the degree, I conceive, it merits, it is my intention here, to fet both the utility and practicability of it in a juft and full light: the firft ftep towards the eftablifhment of any undertaking, which requires numbers, being to incite numbers to attempt it.

"In examining into the importance of producing raw ſilk in Great Britain, we muſt conſider it, as a commodity we at preſent wholly purchaſe of foreigners: as one of which we ſo purchaſe to an extreme great amount, that lies almoſt entirely againſt us in the balance of trade with the countries of whom we take it:—as one, the price of which is now ſo high, as to bring the moſt perplexing diſtreſs on our manufacture of wrought ſilk, by the temptation it gives to the contraband importation of that of the French, an evil, which muſt continue unleſs ſome extraordinary remedy be found for it:—and as one, of which the future ſupply is precarious, and may ſo fail, as to occaſion hereafter the abſolute ruin of our manufactories of wrought ſilk. The prohibition of the exportation of this article from China, whence we before obtained part of what we uſe, which has had a great effect on the general price of ſilk here, evinces the ground there is for the laſt of theſe conſiderations, as the ſame, or other cauſes, may, from various events, deprive us of the reſources we yet have for the procuring what we want. The reſt of the conſiderations are founded on ſuch notorious facts, as render any proof of, or argument for their truth unneceſſary; and take away all occaſion to expatiate further on the matter in this view.

"There is, nevertheleſs, another principle of equally intereſting conſequence, from whence the importance of producing ſilk in England may be deduced. This is, the employment it may afford to idle hands, and the diſtreſſed poor. To judge properly of the extent of this benefit, it is requiſite to enquire into two points: how many and what ſort of perſons theſe hands would be? As to the firſt of theſe points, or how many people might be employed in the buſineſs relative to the production of ſilk: could the matter be at all carried on with profit to the undertakers, the number of hands that might be enlarged in the various offices of tending the worms, and winding the ſilk, would be extremely great; far beyond what thoſe of any other manufacture or culture could equal. As to the ſecond point, or what kind of perſons might be proper for this work: it would happily be, for the moſt part, women and children, whoſe preſent idle and unemployed ſtate is not leſs the ſource of vice, than it is of miſery. This is a conſideration of the moſt moment to our country in its preſent ſituation, of any other whatever. Since to eſtabliſh the habit of induſtry in females, and the youth of both ſexes, is the only means to check the growth of that licentiouſneſs and depravity of manners in the lower people, which ſeems to threaten the deſtruction of all civil order among us. Nothing can more conduce to reform, as well as to enrich Great Britain, than the finding out the means of ſettling to work all the idle youth, women, and poor of both ſexes.

"In every light, the introduction of this moſt valuable produce, appears of ſuch conſequence to us, as renders it highly worthy the diſquiſition, how far there is a probability the obtaining it could be effected. In order to this, it is proper to examine into four ſeveral circumſtances, the right concurrence of all which is, indiſpenſibly, requiſite. The firſt is, whether the climate of this country will agree ſufficiently well with the ſilk-worms, to admit of their being duly propagated, and preſerved while they are making the ſilk: the ſecond, whether the proper food can here be provided for them: the third, whether the preſent rate of labour and other attendant charges, would not raiſe the expence of producing the ſilk beyond the due bounds: and the fourth, whether the knowledge neceſſary to the performing this matter, as a practical art, is to be obtained here by thoſe who may be diſpoſed to attempt it. To ſome, or all of theſe circumſtances, the objections muſt relate, which are brought againſt the practicability of our producing raw ſilk with profit: and I ſhall, therefore, conſider them ſeparately, in order to weigh more juſtly the force of what is alledged with regard to each.

"As to the firſt circumſtance, that is, whether the climate of this country will agree ſufficiently well with the worms, to admit of their being duly propagated and preſerved, till they have made the ſilk: the negative of it has been generally ſuppoſed; and offered as a principal reaſon againſt the practicability of our producing ſilk with profit. But this notion does not appear to be well founded, when the facts, which juſter obſervations and experience in the right method of treating the worms, have brought to light, are well attended to. It is true, that if the ſame method, with relation to the time of hatching the eggs, &c. was purſued here as in the more ſouthern countries, deſtructive accidents would frequently occur: but it is now well underſtood how to retard the hatching, &c. and keep back the otherwiſe too forward vital progreſs of this animal through its ſeveral ſtages, to accommodate it to the peculiar circumſtances of this climate: by which the hazard may be avoided. And if it be ſaid, that, after all, moiſt hot weather will ſometimes kill the worms, the ſame may be affirmed in a greater degree of the ſtrong heats in Piedmont, Lombardy, and other parts of Italy; ſo that the argument deduced from this fact, would prove too much: ſince it would equally or more forcibly operate againſt the practicability of producing ſilk in thoſe countries, where it actually is produced in the greateſt quantities. Theſe tender animals ſuffer in every climate from unfavourable weather; and more generally in ſome ſeaſons in the ſouthern countries than with us, provided we uſe the due precautions; but this is a diſadvantage and not a total obſtacle to the production of ſilk with profit, as we ſee by the abſolute fact itſelf. The principal ground of this opinion, of the unfitneſs of our climate for producing ſilk, aroſe from the improper treatment of the worms here; owing to the ignorance of a better method; as trials made in a more judicious manner, have experimentally ſhewn.

"As to the ſecond circumſtance, or whether the proper food can be provided for ſilk-worms here: it has alſo been denied, but with leſs foundation than the foregoing. The mulberry-tree, particularly the black kind, the leaves of which are the food of ſilk-worms, flouriſhes as well, and is as hardy here as moſt other trees; and the white kind, though ſomewhat more tender, is yet eaſily cultivated even by ſets or cuttings. But the black affords, in general caſes, as proper food for the ſilk-worm, as the white; and is indeed, in ſome ſilk countries, the kind in common uſe. There is, however, an advantage in intermixing ſome of the white, which is, that the buds open earlier, and the leaves are tenderer, and conſequently furniſh food for the young worms ſooner, and more kindly to them, than the black. As theſe trees can, therefore, be eaſily propagated in any number, here as well as elſewhere, even from cuttings, there can be no want of means of producing food for the worms, and at the ſame expence, as in other places. It muſt be allowed indeed, theſe trees come into leaf later here, and conſequently do not afford the food ſo ſoon as in the ſouthern countries; but the progreſs of the worm to the ſtate, which renders it neceſſary, may, as I obſerved above, be correſpondently retarded, and then this objection ceaſes. There is, moreover, one circumſtance peculiarly favourable to us in this point: which is, that the leaves of the mulberry-tree never blight here after the buds are opened: an accident to which they are greatly ſubject in ſome of the parts of Europe, where moſt ſilk is produced, to the great embarraſſment of thoſe concerned in it. In this particular of the proviſion of food for ſilk-worms, we ſtand therefore on at leaſt as good a footing as any of our rivals in it: and conſequently no juſt objection can lie on this head.

"As to the third circumſtance, whether the preſent rate of labour, and other attendant charges, would not raiſe the expence of producing the ſilk beyond the due bounds; it muſt be admitted, that the whole ſtreſs of uncertainty muſt reſt here, and that it is not ſo eaſily to be cleared up, as in the other three points. It is by no means, however, evident, that the price of labour would be an invincible impediment to the produce of ſilk, if we conſider, that the far greateſt part of the work may be done by women and children, and ſome of it even by perſons aged and infirm. And as, in a great many towns and villages, numbers of hands of this kind, are at preſent wholly unemployed, they could afford to work at very low rates, and yet with great advantage to themſelves. For where perſons, whoſe ſtrength, either in conſequence of youth, old age, diſeaſe, or want of habit of working, are not fit for common labour, and lie a dead weight on their families or pariſhes, every conſtant aid becomes of great conſequence to their comfortable and better ſupport. The argument drawn from the high rate of labour does not, therefore, hold good, with respect to undertakings, where those are to be employed, who earn nothing at present: because the price of such labour cannot be taken into the comparison, in this view, betwixt country and country, as it has in fact no price any where, and this principle is most manifestly verified, by experience at Birmingham. In that town, great numbers of women, children, and infirm persons, even most of those in the parish work-house, having been engaged in the manufactures, the undertakers have reduced to a surprizing degree the price of every article they have taken in hand. The people of Geneva, one of the cheapest and most industrious places of Europe, were beat by them out of the manufacture of enameled toys, which they had for a long time monopolized: the founding, gilding, and laquering ornamental articles in metal, have been carried by them over all other places in a most extraordinary manner, and proves that where waste hands are employed, the common high rate of labour in the country becomes no obstacle to the establishment of any manufacture. That there is not any want of such hands in most places of Great-Britain, is too regretfully obvious; and that they may, by proper degrees, be brought to work, where opportunity, example, and encouragement are duly given, is evident from the instance of the town here mentioned. The argument, therefore, from the great price of labour in England, against the production of raw silk, however specious, on a slighter view, seems to vanish, when these particulars are brought into consideration: and perhaps, the dearness of all the necessaries of life, which tend to the injury of those manufactures, where strong and able hands only can be employed, may, in a short time, conduce to the promoting those, which may be carried on by the weak, and less able: as distress is the most fertile parent of industry, and even women and children, though habituated to sloth, may be brought to work, when they can no longer find the means of eating without it. Though there are, indeed, too many instances, in some counties, which show, that the habit of idleness is proof against nakedness. Mr. Pullen in his ingenious treatise, of which it will occur to take further notice below, says, that "he takes it for granted the culture of silk-worms cannot be performed by the lower class of people." But he explains, that he only means, they cannot be undertakers of it, because the worms require proper rooms, fires, mulberry-trees, &c. But this by no means makes against their being employed by those who have skill to direct them; and a very moderate fund to provide these conveniencies. As to the other attendant charges, they would, in a large concern, be very moderate. A plantation of three thousand mulberry-trees, which might occupy three acres of ground when in maturity, or in proportion while they are younger, would provide for as many worms, as would produce in silk of good quality, twelve hundred pounds sterling in value or upwards. The rest, beside the labour, would be slight buildings, fire, stands, basons set in brick-work, reels, and some other trifling implements. But I cannot give a juster view of the small compass, the whole might be reduced to, than by quoting Mr. Pullen's observation on this point: who says: "When it can be shewed, that two or three large mulberry-trees, or a proportional number of small ones, will feed a sufficient number of worms to make a pound of silk: that the stand, which holds these worms, will not take up a yard space in a room: that one person, skilled in reeling, can, with the help of a boy to turn the reel, wind off two or three pounds of silk in a day: that one pound of this silk will make near five yards of padusoy: that the whole time, from the hatching of the eggs to the reeling of the silk, amounts to no more than six weeks: that a small part of each day is sufficient for the proper attendance: and that, besides all this, it can be done with much less trouble than is generally undergone. These things, I say, being considered, and, as I hope, shewn in the progress of the instructions given in this book, then the managing of the silk-worm will appear in a more inviting light, and be looked upon as an entertainment, neither unpleasing nor unprofitable."

"This may serve to give a general view, how easy and moderate the expence of labour, &c. would be, if women and children were employed in a large manufacture of raw silk; and how small the other disbursements would be in proportion to the return: so that, perhaps, there is no undertaking of equal consequence and extent, which could be carried on with a more moderate capital than this.

"As to the fourth circumstance, or whether the knowledge necessary to the performing this matter, as a practical art, is to be obtained here by those, who may be disposed to make such an attempt, it may be now safely answered in the affirmative, though till lately great difficulties arose on this head; as neither the art of breeding and managing the worms, in a manner suitable to this climate, nor that of winding off or reeling the silk, were well understood. But at present the proper treatment of the worms is well known: and not only models of the reel used in Piedmont, the best hitherto brought into practice, are to be easily obtained: but Mr. Pullen has constructed a very good one, different from what are in use elsewhere, and very well adapted to the purpose. He has, also, published a treatise on this subject, where all the principles are well inculcated, and many just instructions given for performing the particular offices, both with regard to the treatment of the worms, and the cocoons or silk balls. It must, indeed, be allowed, that some of the methods he teaches, are rather accommodated to the pursuit of this matter as an amusement than as an article of commerce; such as hatching the eggs in the bosoms of living persons, the keeping them in bed-chambers, and the killing the worms by the heat of the sun, or the steam of water; all which, together with the preservation of a due heat and dryness in the room, where the worms are to inhabit, might be performed by stoves regulated by thermometers, in large manufactories: but this will be easily allowed for by those, who study his book with a view to applying it to practice in large. This treatise, therefore, if well understood, will furnish sufficient knowledge to any intelligent person, to begin this work, as to the management of the trees, worms and silk; and the society for the promoting arts, &c. have, in their possession, both one of Mr. Pullen's, and one of the Piedmont reels, by which any person may, on application, have either kind made. And I doubt not, gentlemen, but that your Museum will be an open channel of communication, to the displaying or removing any difficulties that shall offer to such as may engage in this work: as I know some gentlemen, who are extremely well versed in the matter, that will be very ready to lend their aid, by furnishing all the requisite information, to any who shall publickly call upon them for it.

"The practicability of producing silk in Great-Britain with profit to the undertakers, may therefore be very reasonably presumed, from what has been here advanced. But it must be acknowledged there are some difficulties which stand in the way of our expectation, that we shall not soon see the matter accomplished.

"In the first place, though it is the poorest people, who must be employed in this undertaking, as to the actual labour, yet it is by no means they, who must begin it. A capital is wanting; and also a liberal turn of mind and docility, not belonging to the lowest class of people, to learn a new art, and conduct the several parts of it, till it is so established, that imitation may afterwards be a sufficient guide. A plantation of mulberry-trees is first requisite, after that, proper buildings, with the utensils, and other apparatus for breeding, feeding, and preserving the worms, and for winding the silk. For though, after the establishment of several large manufactories of this kind, the production of the cocoons or silk balls, and the winding of the silk, may be separate undertakings; yet in the infancy of an attempt to produce raw silk, and indeed, till considerable quantities of cocoons are produced in the same neighbourhood, they must be carried on conjointly. It is necessary, likewise, that some sagacious, sensible person enterprize the superintendance and direction of such a work, till the inferior hands are rendered capable of acquitting themselves well in their respective offices; and that extraordinary attendance and care be observed, till both the skill of performing properly, and habit of attending diligently, are acquired, by all who are concerned in the management of the worms; but, if a number of persons were once duly initiated into the knowledge, and habituated to the practice, they would soon be capable of leading and teaching others.

"The

"The reafons here advanced, for the practicability of producing filk in Great-Britain, are founded on the fuppofitions, that the methods now practifed are to be purfued. But a much more favourable profpect of fuccefs prefents itfelf, when it is underftood, that very great improvements may be made, in every part of this art, which regards the treatment of the worms, on principles that are inconteftable. In large concerns, all the difadvantages, arifing from change of weather, may be totally removed, and the deftruction of the worms, from that caufe, much more effectually provided againft, than they can in hot countries. Since it is much more practicable to procure a due degree of conftant equal heat in colder climates, than to prevent too great a one in hotter. By means of tin pipes, diffufing the moft regular heat from ftoves, and of proper ventilators, the air may be always kept of an exact temperature, and yet continually changed at difcretion, fo that neither cold, moifture, nor ftagnation, may affect the worms: and this may be done with a fmall comparative expence, either with regard to the conftruction of the apparatus, or provifion of fuel. The hatching, and killing the worms, may, in like manner, be performed by ftoves, with much greater eafe and certainty, than by any of the methods ufually practifed. By the fame means, it is alfo practicable, to have a fecond product from the fame breed in one feafon; as well here, as in the fouthern countries: an advantage never hitherto brought into confideration by thofe, who have taken their notions only from a view of the prefent methods, and the accidents attendant on the natural ftate of the air in our climate. The certainty with which I fpeak of a fecond product the fame year, is not the refult of fpeculation only; but of pofitive information. For a gentleman of unqueftionable veracity, who refided fome time in China, and was at a confiderable expence in diving into all the myfteries of the Chinefe methods of the treatment of the filk-worms, even fo as to procure operators from a diftant part of the country, to perform the whole in his own houfe; affured me, that they had the art to breed, hatch, and fet to work the worms, as many times repeatedly in the year, as they chofe, allowing the due time for the progreffion from the new-laid eggs, to the time of breeding in each fucceffion. This gentleman is now abroad; but he told me, before he went, that he had communicated the whole of the Chinefe method, to a very great perfonage, in order to its being rendered of public utility. It is, therefore, to be hoped, the particulars will in due time be laid open, and fome lights thence gained, that may conduce to the further improvement of this art. The great perfection to which the conftruction of clofe ftoves, conductory warming pipes, and ventilators of every fize, is now brought, renders the application of proper heat to any of the purpofes, refpecting the management of filk-worms, much more eafily and accurately practicable than it would have been formerly: and the improvements of the reel, and the methods of winding off the filk, equally facilitate that part of the work to thofe who are to learn it.

"From a juft view of all thefe circumftances, it may be reafonably inferred, that there is no natural nor œconomical caufe of impediment to the production of raw filk in Great Britain, as an article of commerce, and that the importance of fuch an undertaking is, as above obferved, fo great, as to merit every public and private encouragement. It may, neverthelefs, be objected by fome, that this article fhould be left to North America, where the government has appointed aids for it, and where fome beginnings have been actually made. But to this, I anfwer, that the very flow progrefs, or rather the prefent retrograde ftate of the undertakings there, though pufhed forwards by very extraordinary encouragements, as well from the London fociety for promoting arts, as the government: who, befides the giving a large bounty, have erected a public filature, fhew the great difficulties they labour under; and the little profpect there is, that the confumption at home fhould be provided for from this quarter. Indeed, it feems very apparent that this concern is not fuited to colonies, where there is neceffarily a want of thofe unemployed hands, which are alone proper to be employed in it. The number of thofe poor families, where the women and children live on the earning of one man, paid only as a mere labourer, are very few in fuch places, compared to what they are with us: and yet the work muft be done by fuch women and children, to put the undertaking on a footing with thofe of other countries, whence we now take the raw filk, where this is entirely the cafe. If America, therefore, has fome advantage in the warmth of the climate, an advantage, perhaps, that does not avail over a proper ufe of ftoves and ventilators, as above intimated; yet in this other point, of being provided with proper hands, we have an infinitely greater advantage over them: and there can be no reafon we fhould neglect or facrifice it to the fpeculation of ferving them, in a matter where the event is fo precarious. It would be a great length of time before they could find hands, fhould they fucceed at all in this attempt, to produce the great quantity of raw filk we ufe in our manufactures, which is indeed fufficiently large to find work for very great undertakings both there and here. And there is no reafon of policy, why we, in a matter which may be fo properly confidered in the light of a manufacture, fhould give them the preference." *Mufeum Rufticum, vol.* VI. *pag.* 89.

SILVER-WEED, or *wild Tanfey*, a fpecies of cinquefoil which grows naturally upon cold ftiff land in moft parts of England, and is a fure mark of the fterility of the foil. Its ftalks fpread upon the ground, and fend out roots from their joints; by which means, and by the frequent fhedding of its feeds, for it flowers during the whole fummer, it foon over-runs, and fills the land to a great diftance. The leaves of this plant are compofed of feveral lobes or wings, which are generally placed along the midrib, and terminated by an odd one: they are jagged at their edges, and are of a filvery colour, efpecially on their under fide. The way to deftroy this kind of growth has been already pointed out. Mr. Ray fays, that the root of wild tanfey, which is fomewhat of the parfnip kind, is good to eat, and that hogs are very fond of it.

SIMPSON, groundfel.

SIT-FAST, a part of a horfe's hide turned horny, and which if it cannot be diffolved, and foftened by rubbing with mercurial ointment, muft be cut out, and afterwards healed as a frefh wound. It generally proceeds from a warble. *See the article* WARBLE.

SIZZING, yeaft, or barm.

SKID, the chain by which the wheel of a waggon is faftened, fo as to prevent its turning round, upon defcending a fteep hill.

SKILLING, an ifle, or bay of a barn.

SKIRRETS, a kind of pafnep, which thrive beft in a light and moift foil. They are propagated either by feeds, or by flips from the root, which is compofed of feveral flefhy fibres, about the thicknefs of a man's little finger, terminating in one head. This root, for which only the fkirret is cultivated, is reckoned wholfome and nourifhing: but it is flatulent, and too fweet tafted for many palates. The feeds of this plant, which generally produce larger roots than the flips, fhould be fown about the end of March or the beginning of April, and if they are good, the plants will appear in five or fix weeks. When they have put out their leaves fo as to be well diftinguifhed from weeds, the ground fhould be carefully hoed; and this fhould be repeated three feveral times, in the fame manner as is practifed for carrots. In thefe hoeings, which fhould be performed in as dry weather as poffible, the better to deftroy the weeds, the fkirrrets, whether fown in broaft caft, or in drills, fhould be thinned to the diftance of at leaft three inches from each other. In autumn, when the leaves begin to decay, the roots will be fit for ufe. Thefe may be preferved all the winter, and till they begin to fhoot in the fpring, when they will become hard and fticky. So will alfo thofe which run up to feed the firft fummer, and which fhould therefore be pulled up and thrown away.

The feafon for propagating fkirrets by offsets is in the fpring, before they begin to fhoot. The old roots fhould be dug up then, and the fide roots fhould be flipped off with an eye or bud to each. Thefe fhould be planted four inches afunder, in rows fufficiently diftant to leave room for digging between them.

SLAB, the out-fide plank of a piece of timber when fawn into boards.

SLECK, fmall pit-coal.

SMALLAGE, or water parſley, a plant growing naturally by the ſides of brooks and ditches in many parts of England, and is rarely cultivated in gardens. Thoſe however, who are fond of it in their pottage, may raiſe it in a moiſt ſoil, either by ſlips, or from ſeeds ſown in March. This ſeed is reddiſh, and pretty big, of a roundiſh oval ſhape, a little more full and riſing on one ſide than on the other, and ſtreaked lengthwiſe.

SMUT, a diſtemper incident to corn, and which, according to M. Duhamel, may be diſtinguiſhed by the following marks.

"1. This diſtemper deſtroys entirely the germe and ſubſtance of the grain.

"2. It affects not only the ear, but alſo, in ſome degree, the whole plant, when it has made a great progreſs.

"3. It very ſeldom happens but that when one ſtalk is ſmutty, all the ears of the other ſtalks from the ſame root are ſo too.

"4. So early as in March or April, upon opening carefully the hood or blades which cover the ear, and examining the young ear, then not above the ſixth part of an inch in length, and almoſt cloſe to the roots, I found this embryo already black, and attacked with this diſtemper. Perhaps it may not always ſeize the plants ſo early.

"5. When the diſtempered ear comes out of its coverings formed by the blades, it looks lank and meagre; the common and immediate coverings of the grains are in this caſe ſo very ſlight and thin, that the black powder is ſeen through them; and from this time nothing is found, in lieu of grain, but a black powder, which has a fetid ſmell, and no conſiſtency. As this powder, of which the conſtituent particles have but very little coheſion, and of which the coverings are deſtroyed, is eaſily blown off by wind, or waſhed away by rain; the huſbandman, in houſing theſe plants, houſes only ſkeletons of the ears. If any impreſſion of this powder remains, it is eaſily taken off by ſifting: but I have not experienced it to be contagious, like that of burnt-grain.

"M. Tillet, who gained the prize propoſed by the Academy at Bourdeaux for the beſt account of what renders black the mealy ſubſtance of grain, has obſerved that theſe corrupted ears are often found to be vitiated even in the hood, though this laſt looks as green and perfect as if nothing ailed the corn within. The upper part of the ſtalk of a ſmutty plant is not, commonly, quite ſtrait, from within about half an inch below the ear. If ſuch a ſtalk is ſqueezed there, it ſcarcely yields at all to the preſſure. If it be cut aſunder at about a ſixth part, or a quarter of an inch, below the ear, it will be found to be almoſt entirely filled with pith, in ſuch manner that only a very ſmall opening can be perceived in the heart of this ſtalk, inſtead of the large pipe that is in healthy ſtems. M. Tillet concludes from hence, that the circulation of the juices is obſtructed in the upper part of the ſtalk of ſmutty plants.

"Bearded wheat is apt to be ſmutty, as that which is not bearded; but neither M. Tillet nor I have ever met with a ſmutty ear of rye.

"Cauſes of ſmut.—The ſmuttineſs of corn cannot be owing to a want of fecundation, as many have hitherto miſtakenly imagined; ſince it affects and deſtroys the organs of both ſexes long before the time of that fecundation.

"It cannot be imputed to the ſettling of wet upon the ears, or to fogs, or to a violent impreſſion of the ſun; ſince we have ſeen the ears ſmutty long before they ceaſed to be covered with the blades, which continue green till the diſtemper has made a great progreſs.

"The ſame obſervations refute abſolutely the opinion of thoſe who ſuppoſe the cauſe of the ſmut to be in the grains, after they are formed, and before they are paſt their milky ſtate.

"The ſmut of corn has been alſo aſcribed to the moiſture of the earth: but we do not ſee more ſmutty plants in the loweſt, and conſequently wetteſt parts of a field, than in the higheſt and moſt dry. Beſides, why ſhould there be a ſingle ſmutty plant in the midſt of numbers of ſound ones? However, as it appears that corn is more frequently attacked with this diſtemper in wet years, than when the ſeaſons are dry; too much moiſture may perhaps, without being the immediate cauſe of the ſmut, favour its progreſs more than drought would do.

"Some naturaliſts have aſcribed this diſtemper to inſects. If I am not authoriſed abſolutely to deny this, I can at leaſt aſſert that, after having been of this opinion for ſome time, all my endeavours to eſtabliſh it by facts have proved ineffectual. Some obſervers have indeed ſhewn me different inſects in ſmutty grains; but as I found the very ſame kinds likewiſe in ſound ears, I believe, with M. Tillet, that they are not in any manner the cauſe of this diſtemper. We know that the corn-caterpillar devours the mealy ſubſtance of the grain: but it does not occaſion ſmut. Numbers of flies lay their eggs upon theſe ſeeds; and the worms and maggots which proceed from them, eat the ſeeds: but this does not occaſion any thing like ſmut. The Reverend Dr. Hales, to ſatisfy himſelf whether the ſmut of corn might not proceed from the ſeeds being bruiſed by the flail, took a number of grains of different ſizes, and bruiſed them with a hammer. They grew well, and bore ears which were not ſmutty. Thus his own experience convinced this ſkilful philoſopher, that he had conceived a wrong idea of the cauſe of this diſtemper.

"Several cultivators have thought that pigeons dung and that of ſheep render corn ſmutty: but this is a groundleſs notion. We have large pigeon-houſes, the dung of which is ſtrewed upon our wheat lands: the ſame is done with the dung of our ſheep, and we even fold our flocks upon thoſe lands: yet we do not find that theſe fields are more infected with ſmut than others. This allegation is therefore abſolutely deſtitute of proof.

"Wolfius was of opinion that the ſmut of corn proceeds from a monſtroſity of the embryo: but M. Aimen has refuted that ſuppoſition, by ſhewing that the male flowers of certain kinds of plants are attacked with this diſtemper: now the flowers have not any embryo.

"M. Aimen, M. D. has very judiciouſly obſerved, that the ſmut of corn cannot derive its origin from a defect in the ſap; as all the parts of the plant, except the ear, look healthy, and there are plants whoſe roots are perennial, which appear vigorous, though their ſeeds are ſmutty every year. He is of opinion, that whatever weakens the plant is apt to bring on the ſmut, and inſtances, as a proof of this, that it is a frequent cuſtom in his country to cut rye as ſoon as it ſpindles, for food for their cattle; and that this rye generally produces other ears, which ſeldom contain any but diſtempered grain: to which he adds, that ſeed-corn which has been pricked or run through with a needle; or which is not throughly ripe, and that which produces lateral or ſecond ears, is ſubject to the ſmut.

"The ſame obſerver, who has made ſeveral careful reſearches into what is properly called the ſmut of corn, holds that this diſtemper proceeds from an ulcer which attacks firſt the parts that ſuſtain the ſeeds, and afterwards ſpreads to the reſt of the flower. But, ſome will ſay, what is the primary cauſe of that ulcer? In order to diſcover it, M. Aimen examined ſeveral grains of barley with a microſcope: ſome of them were bigger than others: ſome were very hard; and others yielded to the preſſure of his nail: ſome were of a deeper, and others of a lighter colour; ſome longer, and others rounder, than they ought to have been: their rind was ſometimes wrinkled in ſeveral places, whereas in its natural ſtate it is ſmooth: and laſtly, he perceived upon ſome of them black ſpots, which, when examined with a magnifying glaſs, appeared to be covered with mould. Theſe grains were ſeparated carefully, according to their ſeveral conditions, and ſown apart, though in the ſame ground. All the mouldy grains produced ſmutty ears, the ſhrivelled, the parched, and thoſe that were attacked by inſects, either did not grow at all, or did not produce any ſmut.

"He then ſingled out a parcel of ſound grains, ſowed them, and ſome time after took them up in order to examine them again with a magnifying glaſs. He found ſome of them mouldy, replanted them all, and obſerved that the mouldy grains produced ſmutty ears.

"M. Aimen, without pretending that this is the only cauſe of the ſmut of corn, concludes from theſe experiments, that mouldineſs is a cauſe of this diſtemper.

"It is very hard to conceive how mouldineſs can produce this diſtemper; for as ſoon as the ſeed has ſprouted and produced its plant, the whole ſubſtance of the grain is conſumed. Whether the hulls or coverings grow mouldy or not, feems to be a circumftance quite immaterial to the plant, which ceafes from that time to fubfift on what the feed had fupplied it with till then. We readily conceive that if this mouldnefs attacked the plant, it might either kill it or render it poor and weak: but we cannot imagine how this mouldinefs fhould affect only the organs of fructification, and entirely deftroy them, without doing any vifible injury to the other parts of the fame plant, even though it be a perennial. However, M. Aimen relates facts; to account for which one might conjecture, fuppofing the increafe of plants to be only an extenfion of the embryo, that the organs of fructification which exift in imperceptible miniature in the feed, were already affected by the mouldinefs before the grains were depofited in the earth. But let us abide by well obferved facts: it being of more importance to collect them, than to be in a hurry to explain them by conjectures hitherto attended with little probability.

"Means of preventing this diftemper.—M. Aimen is of opinion, that, to prevent this diftemper, the fineft and ripeft corn fhould be chofen for feed, that it fhould be threfhed as foon as poffible, and that it fhould be limed immediately after, as well, fays he, to keep it from growing mouldy, as to deftroy the mould already formed, if any fuch there be; adding, that every method he has tried to make corn fo prepared grow mouldy, has been ineffectual, and that he has never known it produce fmutty ears."

According to this principle, the preparations which have been experienced to be ferviceable in the cafe of burnt-grain, and particularly M. Tillet's lye, may be equally beneficial to guard againft fmut. But we fhall not attempt, continues M. Duhamel, to make any addition to M. Aimen's advice, becaufe we have not ftudied the diftemper properly called fmut, fo much as we have that far more dangerous one which we diftinguifh by the name of burnt-grain. According to fome experiments made by M. Tillet, the black powder of fmutty corn does not appear to be contagious. However, we fhould fpeak more affirmatively on this point, if we had been able to collect a fufficient quantity of that powder: but, as was faid before, the wind and rain carry it away, and but very little of it is found in granaries. We exhort thofe who wifh to contribute to the progrefs of agriculture, to make farther trials, in order to afcertain whether the fmut of corn be really contagious or not: but at the fame time we caution them to be careful not to confound this diftemper with the uftilago, or burnt-ear; for want of which diftinction feveral philofophers have hitherto been mifled.

As weak plants are moft fubject to fmut, M. Aimen recommends good tillage, as a fure means of giving them ftrength and vigour. It is probably for this reafon that corn is very feldom fmutty when managed according to the new hufbandry.

He obferves, that all the lyes generally made ufe of, preferve the plants from mouldinefs; and of all of them, lime feems to him the moft effectual.

"M. de Lignerolle fays, that the fureft means of avoiding fmut, and that which he has practifed with fuccefs ever fince the year 1739, on upwards of three hundred acres of land, is, to change the feed every year, to be very careful that the feed-corn be well dried and thoroughly ripe, and that it be not fmutty, nor have any fmutty powder fticking to it. He then pours boiling water on quick-lime, in a large tub; and after the ebullition is over, as much cold water as there was hot, and ftirs it all ftrongly together, in order to diffolve and thoroughly mix the lime. The quantity of wheat intended to be fowed is fprinkled with this lye, and then well ftirred with a fhovel, and laid in as high a heap as poffible. It is beft to keep the grain for a week after this preparation, turning it every day; for otherwife it would heat fo as to deftroy the germe. By thefe means he has not had any fmut, when the fields around him have been infected with that diftemper.

"M. Donat, near Rochelle, thinking the ingredients commonly employed in fteeps too dear for the ufe of farmers, ftudied for fome years to find out fomething cheaper, eafy to be had every where, and therefore better calculated to be of general ufe. "I have had, fays he, in a letter to M. Duhamel, the good fortune to accomplifh what I wifhed; for I now ufe only pidgeons-dung, quick-lime, afhes, and fea-falt, where this laft can be conveniently had. I have fometimes made with thefe ingredients, fteeped in water, fo ftrong a liquor, that it has even deftroyed the germe of the grain. But there will be no danger of that, if care is taken to obferve the following directions, which are the refult of feven years fuccefsful experience, even at times when farmers who have neglected to follow my example, have had fuch wretched crops as have not paid the charge of reaping.

"Take quick-lime and pigeons-dung, of each twenty-five pounds, forty pounds of wood-afhes, and twenty-five pounds of fea-falt, or falt-petre. Put all thefe into a tub large enough to hold half a hogfhead of common water added to them. Stir them all well with a ftick, till the lime is quite diffolved. This lye will keep fome time without fpoiling. It muft be ftirred again juft before the corn is fteeped in it. The grain is then put into a bafket, and plunged in the lye, where it remains till it has thoroughly imbibed it; after which it is taken out, and laid in a heap, till it is quite drained of all its moifture: or, which is a ftill better way, take a mafhing-tub, fill it with grain to within four inches of the brim, and then pour in the lye well ftirred beforehand. When the tub is full, let the lye run out at the bottom, into fome other veffel, in order to ufe it again for more corn. Let the grain be then taken out and laid in a heap to drain; and continue in this manner to fteep all your feed-corn. The wheat thus prepared may be fowed the next day, and muft not be kept above five or fix days, for fear of its heating. This I fay from experience. The quantity of lye above prefcribed, will ferve to prepare twenty bufhels of wheat.

"Mr. Tull obferves, that brining, and changing the feed, are the general remedies for fmut. The former of thefe, he had heard, was difcovered about feventy years before he wrote, by the fowing of fome wheat which had been funk in the fea, and which produced clean corn, when it was a remarkable year for fmut all over England: but he afterwards doubts whether this might not happen by its being foreign feed, and therefore a proper change for our foil. He tells us that two farmers, whofe lands lay intermixed, ufed feed of the fame growth, from a good change of land, and that the one, who brined his feed, had not any fmut, whilft the other, who neglected that precaution, had a very fmutty crop—But again he doubts whether this feed might not have been changed the year before, and fo might not be greatly infected; or at leaft not more than the brine and lime might cure. He adds, that fmutty feed-wheat, though brined, will produce a fmutty crop, unlefs the year prove very favourable; for that favourable years will cure the fmut, as unkind ones will caufe it: but above all, he affures us, that the drill-hufbandry is the moft effectual cure."

"Count Ginanni, a patrician of Ravenna, who has favoured the world with a very accurate and ingenious treatife on the diftempers of corn in the blade, deems the ruft incurable, after it has once taken place. He has prevented it by fprinkling the plants, before their ears were formed in their hoods, with a folution of fal ammoniac or falt-petre in water mixed with falt of tartar, and with other alkaline fubftances; but obferves, that fuch preparations are too dear for the ufe of farmers. He thinks, that fowing thin and keeping the corn quite free from weeds, will generally be a good prefervative, as he himfelf has frequently experienced."

"The fmut in wheat, fays a writer in the Mufeum Rufticum, is an evil which has long been complained of, and many methods tried to prevent it, all of which have proved ineffectual, or, at beft, but a mitigation of the difeafe; which methods I need not here enumerate, as they are generally known, or are to be met with in various authors who have wrote on agriculture: fome of them being calculated to forward vegetation, and ftrengthen the plant, fuch it will be advifeable to continue in the practice of.

"But amongft all the authors who have wrote on this fubject, I do not remember to have feen one who has pointed out a probable conjecture with refpect to the caufe of this malady, fo as to be fupported by any tolerable degree of reafon. And inafmuch as natural hiftory has been, and is my favourite ſtudy, (of which I take agriculture and a knowledge of cattle to be no ſmall part) I have frequently employed ſome leiſure hours, to endeavour to aſſign cauſes for various diſeaſes, to which the productions of the earth are ſubject; among which, this of ſmut in wheat is one. And being deſirous to improve my knowledge, I am willing to communicate, that if any thing worth notice might come from me, I may have the pleaſure of doing ſomething for the public good, and thereby induce others to make their diſcoveries known, from which myſelf, as well as many more, may reap ſome advantage.

" I remember to have read a little treatiſe, wrote ſome years ſince, by James Logan, (chief juſtice, and preſident of the council, of the province of Penſylvania) on the generation of plants, containing obſervations made on the maize, by which he diſcovered that plant to be (what Linnæus calls monoecia, or) a plant bearing male and female flowers, and, as ſuch, capable of being impregnated with a fructifying duſt from another plant of the like kind.

" I own, the reading this pamphlet firſt gave me the hint of the generation of vegetables, from which I continued my obſervations reſpecting other plants, and among the reſt to wheat, and the like; though this is not of the ſame claſs with maize, but of the claſs triandria of Linnæus, and is hermaphrodite, yet, nevertheleſs, equally ſubject to be impregnated by duſt from another plant, as well as with duſt from itſelf.

" Having frequently obſerved amongſt wheat, while green, (though ſhot up into ſpindle) ſeveral black, blighted ears, I examined them, and found theſe were ears in which, by ſome accident, the intention of nature was prevented; I ſuppoſe, by being detained too long in the hoſe, and by the natural humidity of the plant, a fermentation promoted in its ear, deſtroying the ſmall veſſels through which the corns were to receive nouriſhment; by which means their contents became black, dry, and duſty: theſe ears, growing up with the others, imbibe moiſture ſufficient to cauſe the duſty particles in the grains in them to expand, and burſt the fine ſkin which contained them: being thus ſet at liberty, the air, if it happens to be a dry ſeaſon, dries them again; by which means they become light enough to float therein, when ſeparated from the ſkin which held them. If this happens when the wheat is in bloſſom, which it often does, part of this duſt enters the ſtygma of healthy corns, and thereby infects them: the pulp in thoſe becoming black, a fermentation is raiſed therein, which deſtroys the life of the grain thus impregnated: hence the diſagreeable ſmell is acquired peculiar to this diſeaſe (the ſmell in a grain of ſmut being the ſame as in a black blighted ear.)

" From hence it is eaſily accounted for, why, often, a few grains in an ear are ſmutty, and the others good.

" Some may perhaps object, if this be the caſe, why are not barley and oats ſubject to the like diſeaſe, ſince both theſe are ſubject to the black blight as well as wheat? Such objectors would do well to obſerve, that theſe have a more tough ſkin than wheat, which does not burſt till after the blowing of theſe ſorts of corn is over; therefore, when it does burſt, the duſt can do no harm.

" Having thus pointed out the cauſe, I now proceed to preſcribe the remedy, which is, when the corn is ſhot into ſpindle, and the ears begin to appear, let ſome perſons go along each furrow in the field, and carefully break off all ears of the black kind, (not pull them up, becauſe often from the ſame root grow ſeveral others, which are good and ſound ears) and when broke off put them into a bag, and carry them away; for ſhould they be thrown on the ground, there may ſtill be danger of infection from them; and as, 'tis poſſible, there may be ſome of theſe diſeaſed ears, which are not burſten, and therefore may eſcape being gathered, theſe may be known by the ſtalk at the neck being crooked, and bent in the length of three or four inches backward, and forward five or ſix bends, and the hoſe nearer to the head of ſuch than the ears which are good.

" The ſeaſons in which wheat is moſt liable to be ſmutty are, it is well known, ſuch in which it happens to be dry weather and windy at the time of blowing; but if it happens to be wet during that time, it is very rare to ſee a ſmutty ear in a field." *Muſeum Ruſticum, vol.* II. *page* 19.

" As the ſmut in wheat, ſays another writer in the ſame work, is an evil greatly complained of, and not without reaſon, among farmers, I have no doubt but your readers will be well pleaſed to be informed of a means of preventing the damage which is annually experienced in this reſpect.

" As I write from experience, what I communicate may be depended on; and I have great foundation for thinking it will be found of particular ſervice to ſuch of your readers as are practical farmers, and who yet are unacquainted with the method I intend to recommend.

" I have, for many years paſt, eſcaped having ſmutty crops, by a proper care of the ſeed-wheat before it is put into the ground; and the method I purſue, though efficacious, is in itſelf ſimple and cheap.

" I take four buſhels of pigeons dung, which I put into a large tub: on this I pour a ſufficient quantity of boiling water, and, mixing them well together, let them ſtand ſix hours, till a kind of ſtrong lye is made, which, at the end of that time, the groſſer matter being ſubſided, I cauſe to be carefully drained off, and put into a large keeve, or tub, for uſe.

" This quantity is ſufficient for eighty buſhels of ſeed-wheat.

" My next care is to ſhoot into this ſteep a manageable quantity of my ſeed, which is immediately to be violently agitated, with either birchen brooms, or the rudders that are made uſe of in ſtirring the malt in the maſh-tub in a brewing-office. As the light grains riſe, they muſt be diligently ſkimmed off; and after the ſeed has been agitated in this manner for the ſpace of perhaps half an hour, it may be taken out of the ſteep, and ſown out of hand, with great ſafety: and I can venture to ſay, that if the land is in good heart, and has been properly tilled, it will not, when ſown with theſe precautions, produce a ſmutty crop." *Muſeum Ruſticum, vol.* III. *page* 81.

Another gentleman, who ſigns a Norfolk farmer, declares he always obſerved, that if the ſeed was well waſhed it never failed: that he took the hint, and waſhed ſome ſeed which he knew to be ſmutty, in a large tub filled with plain ſimple water, ſtirring it violently with birchen brooms, taking care, from time to time, to ſkim off the light. This anſwered very well, and he has ever ſince continued the practice.

" I read, ſays another gentleman, the above account with ſome degree of ſatisfaction, but am ſorry that your correſpondent ſhould be ſo much a lover of brevity, as to ſay no more on a ſubject of ſuch infinite importance.

" The truth is, we Engliſh farmers have hitherto known very little of the nature of this diſeaſe in wheat, imagining that whenever the corn was black it was infected with the ſame diſorder; but this is far from being the caſe, as any of your readers may ſee, by referring to a piece written by Monſ. de Gonfreville of Normandy, publiſhed in the ſecond number of the Foreign Eſſays on Agriculture, &c. (which I cannot but eſteem a very uſeful work) and containing a detail of a number of experiments made by the above gentleman to aſcertain the cauſe of the ſmut.

" I was not a little pleaſed to find that the method preſcribed in this invaluable Eſſay, for guarding againſt this diſtemper, does not materially differ from that above recommended.

" Both theſe gentlemen depend on the clean waſhing of the ſeed, and the trials of both met with the wiſhed-for ſucceſs."

We ſhall conclude this article, with the following method of preventing this deſtructive diſtemper, ſent us by the ingenious Mr. Bromwell Powell, of Green's Forge, near Stourbridge in Worceſterſhire, dated September 1766.

" I have here, ſays he, ſent you an infallible remedy againſt the ſmut in wheat, a thing ſo prejudicial to the community in general, and which I myſelf have made uſe of for ſeveral yeers paſt, and have ſown ſmutted wheat, prepared as under directed, and have not had one ſmutted ear from the produce; and am well aſſured if the farmers will obſerve the under direction, they never will have any. Now as the coating of wheat with brine and lime, is ſo well known to the farmers in general, I need ſay no more on that ſubject, as you have directions from many authors concerning it: but when wheat is so prepared with brine and lime as is usual, then to every strike of wheat so prepared, add one pound and an half of red lead, by putting it into a cullinder and shaking it gently over the prepared corn, and sometime stirring the corn with a shovel, that every corn may have a spot or two of the lead adhere to it, which when so done is an effectual preservative against the above malady, nor will any fowls lie upon it after so prepared.

"By the above method several of the penurious farmers will look upon it to be a great expence, as the lead will cost, bought in small quantities, three-pence per pound; but admit every strike was to cost six-pence per strike, it would greatly answer the farmer's purpose: I therefore have ordered as small a quantity as can be complied with; but if more was added it would still be a greater preservative. As the time of sowing is now near at hand, I hope the gentlemen will apply to some farmer, whom they can depend upon, to try the experiment of one strike so prepared; and, if they can readily procure it, let half a strike of it be smutted corn when sown, and to that half strike would advise one pound of the lead to be applied, which will be a convincing proof of the utility of the above."

SNAIL-COD, or *Snag-greet*, a name given by Mr. Worlidge, to a species of manure, found at the bottom of deep rivers. It is a kind of mud or sludge, very soft, full of wrinkles, and intermixed with many little shells and snails, to which it is thought to owe a great part of its fatness.

SNATHE, the handle of a scythe.

SOAP-ASHES. *See* ASHES.

SOIL, a general name for all sorts of land. *See the articles* EARTH *and* GROUND.

Soils are divided by our farmers into nine sorts, viz. the sandy, the gravelly, the chalky, the stony, the rocky, the hazely, the loamy, the marshy, and the clayey. *See the articles* SAND, GRAVEL, CHALK, &c.

SOOT, a fuliginous substance formed in chimnies.

Soot, either of vegetables or of coal, is good both for corn and grass, especially on cold moist grounds, or lands apt to be over-run with moss. Many have found their account in strewing it early over their grean wheat and barley: but Mr. Ellis says neither of them ought to be sooted after the 25th of April, because the wheat, and generally the barley, have then done gathering and branching, and are upon the spindle. He likewise thinks it proper to be sown over young turneps, just after they have appeared. But care should always be taken not to strew it too thick, lest its hot nature should hurt the plants. Mr. Worlidge seems to think wood-soot the best: but Mr. Mortimer prefers that which is made from sea-coal, of which about forty bushels are commonly allowed to an acre; though some grounds will require more: to which he adds, that it produces a very fine sweet grass, and destroys worms and weeds; and that it ought not to be sown upon wheat till Candlemas, because the long cold rains and snows are apt to wash it in too soon: nor is it safe to lay it on later, lest a drought succeed and burn it up. *See the article* COAL-SOOT.

SORREL, a well known plant propagated in kitchen-gardens.

Sorrel is used for many purposes in the kitchen, and they who are fond of acid herbs in their sallets cannot well have one whose tartness is more agreeable. The two sorts chiefly cultivated in the kitchen-gardens here are, the common sorrel, which has longish and sharp pointed leaves, and the round-leafed garden, or Roman sorrel. Both of these are perennial; but the round-leaved sort is most esteemed.

This is propagated by its creeping roots, which may be transplanted either in spring or autumn; but the autumn is best for dry ground. The distance between them should be at least two feet every way; for this plant spreads pretty far, and increases greatly, especially on stony land; for its natural growth is upon rocks. It seldom produces good seeds; and hardly any at all when it is set in a light soil.

The common sorrel, which grows naturally in pasture lands in most parts of England, and which is considerably improved by culture in the garden, is multiplied either by its seeds, or by parting of its roots. The former of these methods produces the largest and most succulent plants, if they are allowed sufficient room: but in whichever way they are raised, they should stand at least six inches asunder, in rows so far distant from each other as to admit of digging the ground between them every spring, if not oftener, especially in the hot months, besides hoeing up the weeds whenever these are numerous, or begin to grow tall. Autumn is the best time for sowing of these seeds upon dry land, and also for parting or transplanting the roots, which, with the above management, may stand un-removed for two or three years.

The seeds of the annual sorts of sorrel should be sown about the latter end of March, on a bed of common earth, in rows a foot and an half asunder; and when the plants are come up, they should be thinned to the distance of four or five inches from each other. This, and keeping them clean from weeds, is all the culture that they will require: but both their size and their goodness will certainly be increased by a good stirring or two of the ground, which may easily be given at the time of weeding; for both should be done in dry weather. These plants will flower in July, and their seeds will ripen in autumn.

SOUR LAND, a cold clayey soil. *See the article* CLAY.

SOW, the female of the swine. *See* HOG.

SOWING, the action of scattering the seeds of plants in the ground.

Writers of different countries mention the usual seasons for sowing their several kinds of grain, but do not take notice of any sign by which the husbandman may be directed when to sow his corn with the greater chance of success. For a rule of this kind we are indebted to the justly celebrated Linnæus, a man truly great, not only for his unequalled knowledge in natural history, and his indefatigable industry in the pursuit of that science; but even still more so for his disinterested zeal to turn the result of his studies to the advantage of his country. Far superior to that mean jealousy which little minds are apt to entertain on their discoveries, he nobly calls forth every assistant, and invites each of them to become his rival in promoting the general welfare of mankind, as we are particularly informed by one of his disciples.

"It is now the fourth year, says the ingenious Mr. Harald Barck, a member of the Swedish academy, since our illustrious president exhorted his countrymen to observe with all care and diligence, at what time every tree expands its buds, and unfolds its leaves; imagining, and not without good reason, that our country would, some time or other, reap some new, and perhaps unexpected benefit, from observations of this kind made in different places."

As one of the apparent advantages, he advises "the prudent husbandman to watch with the greatest care the proper time for sowing; because this, with the divine assistance, produces plenty of provision, and lays the foundation of the public welfare of the state, and of the private happiness of the people. The ignorant farmer, tenacious of the ways and customs of his ancestors, fixes his sowing season generally to a month, and sometimes even to a particular day, without considering whether the earth be prepared to receive the seed: from whence it frequently happens, that the fields do not return what might be expected, and that what the sower sowed with sweat, the reaper reaps with sorrow. The wise oeconomist should therefore fix certain signs whereby to judge of the proper time for sowing. We look up to the stars, and without reason, suppose that the changes on earth will answer to the heavenly bodies; entirely neglecting the things which grow around us. We see trees open their buds and expand their leaves, from whence we conclude that spring approaches, and experience supports us in this conclusion: but no body has hitherto been able to shew what trees Providence intended should be our calendar, so that we might know on what day the countryman ought to sow his grain. No one can deny but that the same power which brings forth the leaves of trees, will also make the grain vegetate; nor can any one justly assert that a premature sowing will always, and every where, accelerate a ripe harvest. Perhaps therefore we cannot promise ourselves a happy success by any means so likely, as by taking our rule for sowing from the leafing of trees. We must, for this end, observe in what order every tree puts forth its leaves, according to its species, the heat of the atmosphere and the quality of the soil. Afterwards, by comparing together the obſervations of ſeveral years, it will nót be difficult to define, from the foliation of trees, if not certainly, at leaſt probably, the time when annual plants ought to be ſown. It will be neceſſary likewiſe to remark what ſowings made in different parts of the ſpring produce the beſt crops, that by comparing theſe with the leafing of trees, it may appear which is the moſt proper time for ſowing: nor will it be amiſs in like manner to note at what times certain plants, eſpecially the moſt remarkable in every province, blow; that it may appear whether the year makes a quicker or ſlower progreſs. In upland, the ſowing of barley nearly coincides with the foliation of the birch."

Mr. Stillingfleet, who has given us a judicious tranſlation of ſome ſelect pieces publiſhed by ſeveral ingenious members of that great, and hitherto unrivalled ſchool of natural hiſtory, the univerſity of Upſal in Sweden, under the preſidence of the excellent Linnæus, was told by a common huſbandman in Norfolk, that when the oak catkins begin to ſhed their ſeed, it is a proper time to ſow barley: " and why," adds he, very properly, " may not ſome other trees ſerve to direct the farmer as to other ſeeds. The prudent gardener never ventures to put his houſe plants out, till the mulberry leaf is of a certain growth." Heſiod, continues this gentleman in his ingenious note on M. Barck's foliation of trees, began to fix the proper ſeaſons for plowing, ſowing, &c. by the appearance of birds of paſſage, or of inſects, or by the flowering of plants; but I do not find that this method was ever after attended to till Linnæus wrote. Heſiod ſays, that when the voice of the crane is heard over-head, then is the time for plowing; that if it ſhould happen to rain three days together when the cuckow ſings, late ſowing will then be as good as early ſowing; that when ſnails begin to creep out of their holes, and climb up the plants, it is time to leave off digging about vines and take to pruning. There is a wonderful coincidence, which probably takes place in all countries, between vegetation and the arrival of certain birds of paſſage. Linnæus ſays, that the wood-anemone (in Sweden) blows from the arrival of the ſwallow: and Mr. Stillingfleet finds by a diary which he kept in Norfolk for the year 1755, that the ſwallow appeared there on the 6th of April, and the wood-anemone was in bloom on the 10th of the ſame month. Linnæus obſerves, that the marſh-marygold blows when the cuckow ſings; and Mr. Stillingfleet finds by his diary, that the marſh-marygold was in bloſſom on the 7th of April, and the cuckow ſung the ſame day.

A due temperature of the ſeaſon, with reſpect to heat or cold, drought or wet, for all theſe greatly influence the ſtate of the earth, is eſſentially neceſſary, and ſhould be carefully attended to by the huſbandman when he ſows: but the preciſe time moſt proper for this work, cannot, by any means, be invariably fixed, becauſe it will always depend on the concurrence of a variety of circumſtances. The ſeaſons are more or leſs forward, and the ground is more or leſs dry, in ſome years, than in others. A proper ſeries of well made obſervations would furniſh the beſt of rules in this reſpect, but certainly would not fix the time of ſowing to any particular day, or week, for years to come. Linnæus's method, of carefully obſerving the foliation of trees, &c. would determine the proper times for ſpring ſowing; and Pliny, after mentioning the ſeveral conſtellations by which farmers were guided in his time, inſtructs the huſbandman with regard to autumnal ſowing, upon a principle ſimilar to that of our great modern naturaliſt. " Why," ſays he, " does the huſbandman look up to the ſtars, of which he is ignorant, whilſt every hedge and tree point out the ſeaſon by the fall of their leaves? This circumſtance will indicate the temperature of the air in every climate, and ſhew whether the ſeaſon be early or late. This conſtitutes an univerſal rule for the whole world; becauſe trees ſhed their leaves in every country according to the difference of the ſeaſons. This gives a general ſignal for ſowing; nature declaring, that ſhe has then covered the earth againſt the inclemency of the winter, and enriched it with this manure."

I therefore can only ſay, in general, that it is better to ſow early in autumn, than too late, provided the ſeaſon will admit of it; becauſe the plants are better able to reſiſt the ſeverity of the winter, after they have acquired a certain degree of ſtrength; and their roots being then longer, and conſequently better fixed in the earth, they will be leſs liable to be thrown out by froſt. For this reaſon, in particular, perhaps the colder the climate is, the earlier the wheat ſhould be ſowed. Some lands are of ſuch a nature, that they ſwell greatly in hard froſts, and, ſubſiding again upon a thaw, leave the roots of plants quite bare upon their ſurface. There have, indeed, been years in which fields ſowed very late, for inſtance in December, have done extremely well: but that ought not, on any account, to be made a rule; experience ſhewing that ſuch late ſowings very ſeldom anſwer. On the other hand, the corn is likewiſe expoſed to many dangers when ſowed too early: for the ſtalks which ſhoot up before winter cannot well bear hard froſts, though wheat would not be hurt by them when only in the blade.

M. de Chateauvieux, than whom we cannot have a better guide, is clearly of opinion, that, though the proper time of the year for ſowing be come, the corn ſhould not be put into the ground if the temperature of the ſeaſon be not favourable, and that on the contrary the ſowing of it ought to be deferred, in hopes of a change. " If, ſays he, the weather is very hot, and the earth extremely dry, it will be abſolutely neceſſary to wait till ſome rain has fallen; for otherwiſe the ſeed will riſe but very imperfectly. This I am ſure of, by which I contradict the common ſaying of ſome farmers, that the earth is the beſt granary to keep the corn in. Full of this notion, whenever the ſtated time comes round, they ſow without diſtinction, in wet land or in dry: even heat does not hinder them: they think their ſeed will certainly ſprout well after the firſt rain: but I have always experienced that the plants have come up thin.

" To ſatisfy myſelf ſtill farther in this point, I tried an experiment, purpoſely to know whether corn can be ſowed, with any reaſonable expectation of ſucceſs, when the weather is very hot, and the earth very dry. Upon reading Mr. Duhamel du Monceau's excellent Treatiſe on the Preſervation of Corn, I obſerved, that he had found by his experiments, that wheat dried in a ſtove heated to ſixty degrees of M. de Réaumur's thermometer, had loſt its faculty of growing. From thence I conjectured, that wheat which ſhould undergo a heat, for example, of thirty degrees, during a longer time, would be equally parched up, and rendered incapable of vegetating. I conſidered the earth, when hot and dry, as a kind of ſtove, in which the ſeed, if it remain too long without receiving any moiſture, may become ſo dry, that the greateſt part of it will never be able to ſprout. This reaſoning is juſt, and I therefore determined to have recourſe to that truſty guide, experience.

" On the 18th of July, 1754, at four o'clock in the afternoon, I placed M. de Réaumur's thermometer two inches deep in the earth, and ſcreened it from the immediate impreſſion of the rays of the ſun. The liquor roſe to the thirty-firſt degree, which ſhewed me the heat of the earth.

" The thermometer being afterwards expoſed to the ſun, the liquor roſe to thirty-ſix degrees.

" The ſame day, I ſowed eighty grains of wheat in this ground. The heat continued nearly the ſame during the reſt of that month, and almoſt all Auguſt. On the 31ſt of July, only ten grains had ſhot up, and on the 16th of Auguſt there were in all ſixteen; after which, not one more roſe: conſequently ſixty-four grains out of the eighty never ſprouted at all.

" On the 28th of July I ſowed fifty grains. Only four of them roſe by the ſixteenth of Auguſt, and not one after. Here were again forty-ſix grains which did not grow at all.

" The ſame day, I ſowed ſixty grains in another place. On the 16th of Auguſt only ſix grains had ſprouted, and not one plant more ever appeared after: conſequently here too were fifty-four grains which never grew. All theſe grains were ſowed in my garden, in exceeding good mould.

" I was ſure that the wheat which I ſowed was perfectly ſound, and in every reſpect capable of growing. It was therefore quite clear, that ſo great a number of grains out of the whole, which did not ſprout at all, had loſt the faculty of growing, by their being parched up by the heat and dryneſs of the earth. To be ſtill more certain of this, three weeks after I had ſowed theſe grains, I watered half of them ſeveral times; but to no purpoſe: not one of them roſe, and I found ſeveral of them quite whole in the earth where I had ſowed them.

"After this experiment, on the 11th of Auguſt I ſuſpended the ſowings I had begun on the 8th, and did not reſume them till the 26th, after ſome rain which fell on the 22d and 23d. Theſe laſt ſowings roſe much better than the firſt."

Upon the whole, M. de Chateauvieux concludes from his own repeated practice, that the beſt time for ſowing in ſuch a climate as Geneva (which differs very little from ours,) is, from the 20th of Auguſt to the end of September; and thinks that even the firſt fortnight in October may be taken in, if the land cannot poſſibly be ſowed ſooner. But he allows of this only in a caſe of neceſſity, and judges that, rather than ſow later, it is beſt to ſtay till ſpring.

"Thus, ſays he, it is that experience and obſervation teach us to leave off bad cuſtoms, of ſuch as are not founded on principles with which a man of ſenſe can reſt ſatisfied."

It is of the greateſt conſequence to farmers that every ſeed be placed in the earth at a proper depth, and in the beſt manner: but experiments are yet wanting to determine with due exactneſs, what is the depth which beſt ſuits each kind of grain, in different ſoils,

The method which Mr. Tull propoſes, is a very good and eaſy way to aſcertain this point for each particular ſowing. Take, ſays he, twelve ſticks, or gauges; bore a hole in one at the diſtance of half an inch from the end, in the ſecond at an inch, and ſo on, increaſing half an inch to each of the twelve. Drive a peg into each of theſe holes: then, in the ſame ſort of ground as you intend to plant, make a row of twenty holes with the half inch gauge; put therein twenty good ſeeds; cover them up, and ſtick the gauge at the end of that row; then do the like with all the other eleven gauges. This will determine the depth at which moſt ſeeds will come up; and the drill, if that inſtrument be uſed for the ſowing, muſt be ſet accordingly.

Upon the ſame principle, M. Duhamel dug a trench twelve feet long, ſloping it gradually from the ſurface at one end, to the depth of two feet at the other. He then ſowed different ſeeds in this trench, and, having put the earth into its former place, obſerved, 1, That hardly any ſeeds riſe when buried deeper than nine inches: 2, That ſome ſeeds riſe extremely well at the depth of ſix inches; and 3, That other ſeeds do not riſe at all when they are above one or two inches deep. Experience ſhews, that the ſame ſeeds may be ſowed deeper in a light, than in a heavy ſoil; that grains which lie too deep in the earth to ſpring up in a dry year, may riſe in a warm and moiſt ſeaſon; and that others which are buried ſtill deeper in the ground, will ſometimes remain there ſound and unaltered for ten or twenty years, at the end of which they will grow extremely well, and produce their proper plants, if they chance to be brought to the ſurface, by moving the earth, as was mentioned before.

The uſual way of ſowing in broad caſt cannot anſwer all the intentions of placing the ſeed properly in the earth, and muſt be attended with ſeveral inconveniencies; ſuch as, the ſeed's becoming the prey of various birds and animals; its being laid ſo ſuperficially, that the ſun often parches it up, or a long continued rain, inſtead of promoting a kindly vegetation, ſoaks into the grains and burſts them; the ſeed is very unequally ſowed, becauſe of the inequality of the handfuls which different ſowers graſp: and great part of it neceſſarily falls together into hollows, where the ſurface of the ground is at all unequal, &c.

Senſible of theſe diſadvantages, farmers have, eſpecially for their winter grain, adopted the method of ſowing under furrow, that is, ſowing one half of the ſeed in broad caſt, and then plowing it in, and afterwards ſowing the other half, which is covered by harrowing. But this method is alſo liable to almoſt as many objections as the other: for the quantity ſown in each particular ſpot, and the equal diſtribution which ought to take place throughout the whole, cannot but be even more uncertain than in the broad caſt, where the whole is ſowed at once; nor dares the farmer, in this ſowing under furrow, to omit ſowing the ſecond quantity, leſt great part of what has been plowed down be buried ſo deep that it cannot riſe, eſpecially if the ſoil is at all ſtrong.

Another general fault in the common ways of ſowing, is, that too much ſeed is employed; partly, becauſe cuſtom has eſtabliſhed a kind of rule in that reſpect, and partly on account of the allowance which it is neceſſary to make for what the birds eat, and for what lies too deep ever to riſe; circumſtances by which a very great quantity of corn is abſolutely loſt.

Theſe inconveniencies are prevented by the drill, which, 1, drops the ſeed at whatever depth and diſtance experience has ſhewn to be fitteſt for the particular kind which is ſowed; 2, fills all the furrows with earth, ſo that none of the grain remains uncovered; and 3, lets fall into each furrow the exact quantity of ſeed which has been found to be moſt proper. By this means every ſeed is ſo rightly placed in the earth, that we may be confident they will all do well, if they are not hurt by inſects. But as this inſtrument ſows only the abſolutely neceſſary quantity of ſeed, the huſbandman ought to be certain of the growth of every grain: becauſe it often happens, that part of the ſeed is imperfect and does not ſprout at all. As the eye cannot diſtinguiſh its quality, he ſhould aſſure himſelf of it, by previouſly ſowing fifty or an hundred grains taken by chance, but exactly counted: when theſe ſpring up, the number of plants will ſhew what proportion is deficient, and the quantity of the ſeed ſhould be increaſed accordingly. To know what ſpace ſhould be left between each ſeed thus planted in the furrow, for that ſpace ought to be different according to the nature of the plant, it will be neceſſary to obſerve how much ground a ſtrong and vigorous plant of the ſame kind takes up when arrived at its greateſt perfection, which it will moſt probably attain when cultivated according to the new huſbandry; and the drill may then be ſet ſo as to drop each grain at a due diſtance.

Beſides leaving ſtated diſtances between each of the ſeeds which the drill depoſits in the furrow, a farther eſſential object in the new huſbandry, is to leave proper ſpaces between the rows of corn, which, in this method, are ſowed with the greateſt regularity, nearer together, or farther aſunder, according to the nature of the plants intended to be cultivated. Some do beſt in ſingle rows, others in double, others again in triple rows, and others in quadruple; as will hereafter be more fully ſhewn by ſeveral experiments. *See the article* DRILL-PLOUGH.

SOW-THISTLE, a ſpecies of thiſtle common in corn-fields and paſtures.

SPADE, a well known inſtrument uſed in digging.

SPANCEL, a rope to tye a cow's hinder legs.

SPATLING-POPPY. *See* CHICKWEED.

SPARSED-LEAVES, are thoſe which are placed irregularly about the ſeveral parts of a plant.

SPAVIN, a diſeaſe in horſes, being a ſwelling in or near ſome of the joints, and cauſes a lameneſs.

There are two kinds of ſpavins, called a blood-ſpavin, and a bog-ſpavin.

A blood-ſpavin is a ſwelling and dilatation of the vein that runs along the inſide of the hock, forming a little ſoft ſwelling in the hollow part, and is often attended with a weakneſs and lameneſs of the hock.

The cure ſhould be firſt attempted with reſtringents and bandage, which will contribute greatly to ſtrengthen all weakneſſes of the joints, and frequently will remove this diſorder, if early applied: but if, by theſe means the vein is not reduced to its uſual dimenſions, the ſkin ſhould be opened, and the vein tied with a crooked needle and wax thread paſſed underneath it, both above and below the ſwelling, and the turgid part ſuffered to digeſt away with the ligatures: for this purpoſe, the wound may be daily dreſſed with turpentine, honey, and ſpirit of wine, incorporated together.

A bog-ſpavin is an encyſted tumor on the inſide the hough, or, according to Dr. Bracken, a collection of browniſh gelatinous matter, contained in a bag, or cyſt, which he thinks to be the lubricating matter of the joint altered, the common membrane that incloſes it, forming the cyſt: this caſe he has taken the pains to illuſtrate in a

young

young colt of his own, where he ſays, When the ſpavin was preſſed hard on the inſide the hough, there was a ſmall tumor on the outſide, which convinced him the fluid was withinſide the joint: he accordingly cut into it, diſcharged a large quantity of this gelatinous matter, dreſſed the ſore with doſſils dipped in oil of turpentine, putting into it, once in three or four days, a powder made of calcined vitriol, allum, and bole: by this method of dreſſing, the bag ſloughed off, and came away, and the cure was ſucceſsfully compleated without any viſible ſcar.

This diſorder, according to the above deſcription, will ſcarcely ſubmit to any other method, except firing, when the cyſt ought to be penetrated to make it effectual; but in all obſtinate caſes that have reſiſted the above methods, both the cure of this, and the ſwellings called wind-galls ſhould, I think, be attempted in this manner. If, through the pain attending the operation or dreſſings, the joint ſhould ſwell and inflame, foment it twice a day, and apply a poultice over the dreſſings till it is reduced.

SPAYING, the operation of caſtrating the females of ſeveral kinds of animals, as ſows, bitches, &c. to prevent any farther conception, and promote their fattening.

It is performed by cutting them in the mid flank, on the left ſide, with a ſharp knife or lancet, taking out the uterus and cutting it off, and ſo ſtitching up the wound, anointing the part with tar, and keeping the animal warm for two or three days. The uſual way is to make the inciſion aſlope two inches and a half long, that the fore finger may be put in towards the back to feel for the ovaries, which are two kernels as big as acorns on both ſides of the uterus, one of which is drawn to the wound, the ſtring thereof cut, and thus both taken out.

SPELT, the name of a ſpecies of grain, which though commonly reckoned a ſummer corn, is ſowed either in autumn, or in the ſpring, at the ſame time as wheat and rye. This grain, of which there are two ſorts, one with a ſingle, and the other with a double chaff, though both have always two ſeeds in each huſk, was formerly much eſteemed in Italy and Egypt, and is now very common in Germany, where they make of it bread, which is very nouriſhing and well taſted, but hard to digeſt. They likewiſe brew beer from it in ſome places. It was of this grain that the ancients made their frumenty, of which they were very fond. Though commonly ranked as a ſpecies of wheat, which it is not unlike when growing, its grain is ſmaller and of a blackiſh hue, its ſtalk thinner and leſs firm, and its ear flat and bearded, with ſeeds only on each ſide. Some writers diſtinguiſh a third ſort, by the name white-rye, which they take to be the olyra of the Greeks and Latins; and ſeems to be what Mr. Mortimer calls taitico-ſpeltum, a ſort of naked barley, or wheat barley, cultivated in Staffordſhire, ſhaped like barley, but with a grain like wheat. It is much ſown at Rowley, Hamſtal, and Redmore, where they call it French barley. It makes good bread, and good malt, and yields a good increaſe; and therefore would do well to be tried in other places. It ripens early, does beſt in a dry ſoil, and is not apt to be much hurt by birds, from which its beard and double huſk preſerve it.

SPIKY-ROLLER, a very uſeful inſtrument in huſbandry, lately introduced by the ingenious Mr. Randall, of York, who has alſo obliged the world with the following account of it.

" I think, ſays Mr. Randall, it was in the ſpring of 1752, when I had fifty acres of ground, deſigned to be ſowed with barley, at one particular farm; but the weather had been ſo unfavourable, and the ſpring ſo extremely dry, that there was no ſuch thing as preparing the ground for the reception of the ſeed: and this was the caſe with the whole country, in theſe parts of England. On looking, one morning, at a barley roller, they laid juſt before me, I recollected, that Mr. Ellis, in one of his eight volumes in Huſbandry, made mention of a ſpiky roller, and referred the reader to another volume for its plate and deſcription, which were no-where to be found. I immediately ſent for ſome workmen, and produced this uſeful inſtrument againſt the next morning, as the ſeaſon was far ſpent, and much ground was to be ſowed, in ſeveral farms, with this grain.

" On this morning, a neighbouring, ſubſtantial farmer, paſſed by us, with half the country for clotters, as we were going to put the horſes to the roller, as he had no longer patience to wait for rains, to reduce the rough ſtate of his ground, deſigned for barley-ſeed: he gazed at the roller, ſmiled, and went his way, with his troop. They, after clotting two acres, all returned the ſame way at night; their maſter rolled his eyes all over a field of about twenty acres, ſaw it perfectly fine (as the roller came back upon the ſame ground it went down), and, after a pauſe, ſaid, that was a good hedgehog, for doing ten times more in one day than all his troop together, and ten times finer, than a thouſand clotters could do, in the ſame time. This was the firſt time this farmer ever could be brought to ſay a civil thing of any uſeful inſtrument, though common ſenſe would pronounce the utility of this on his firſt ſeeing it; but the truth is, nothing but ſuch glaring effects can ever convince theſe people, as they have the great art of deſpiſing what they do not underſtand, or have not had in practice for ten centuries.

" While the ſame man was going over the other ground that ſtood in equal need of the roller, the ploughs were ſet on to turn up the ground he had rolled; and, when all was thus ploughed, the roller went again over the whole, to cruſh the clots, thus turned up, and made all as fine as before, by going twice in a place: then they ploughed for a ſeed furrow, ſowed the ſeed in the uſual way, and harrowed it in; then the roller, with a thorn buſh faſtened behind, went over again, once in a place, and left all exceeding fine, which even would not have diſgraced a gardener in his manner of preparing the ground for the garden culture in general.

" The conſequence of this lucky hit was, that, before the country could get their ſeed into the ground, my barley was fairly up, went forwards, and did extremely well; while, in general, my neighbour's barley made but a ſorry appearance, ariſing from the rough ſtate of the ground, which they could not bring into that fine order this grain requires, notwithſtanding all their toil and expence. This atchievement of the ſpiky roller eſtabliſhed its reputation, among the neighbouring farmers; but ſtill they could not prevail on themſelves to be at the expence, which indeed was not ſmall, in having one made for their own uſe. The reſult of all was, that I had other rollers made for the ground in other parts belonging to me, only they were made heavier, and both longer and larger, the better to ſuit the ſoils that were much ſtiffer.

" From this time we never ſowed any ſeed in the common form, but the ſpiky roller, and thorn buſh at its tail, followed the harrows; as it effectually buried the ſeed, and left the ground in a fine ſtate. It may eaſily be conceived, that this operation is of conſequence to vegetation: for the fine mould, being thus ſwept into the holes made by the irons, and where the ſeed was buried, muſt needs greatly promote their growing ſoon, and nouriſh them well above-ground; as it is well known, the finer the mould is, where the ſeed is depoſited, there vegetables are puſhed on to their deſtined maturity, if all other requiſites concur. And upon this principle it is, that if the corn in the ſpring is rolled once in a place in like manner, the owner will be far from having any cauſe to complain of the practice, provided the weather, and ſtate of the ground, will or ought to bear the tread of the horſes, and weight of the ſpiky roller.

" I am very ſenſible this will appear ſtrange to many perſons, as it looks like ſending a herd of rapacious wolves to nouriſh a flock of tender lambs, or tearing, bruiſing, and throwing all the corn up from their very roots, and bringing on a general deſolation over all the ground. This is like Siſyphus in Homer: we crop the ground with much ſweating and tugging, and then ſuffer all to be deſtroyed again, by this ponderous, grinning creature. But it may not, perhaps, be ill expreſſed, when we ſay, that, in order to come at the truth of things in farming, we muſt, according to the Greek epigram, aſcend downwards, and deſcend upward: the moſt triumphant ſucceſs, in the true bias of nature, in eſtabliſhing agriculture, riſes ſafely and ſurely on the foundation laid by bold experiments, that ſeem to contradict ſuperficial reaſon.

" Let us now conſider the effect of this terrible deſolator, as it goes over the young corn. If we conſider the ſyſtem of irons on the roller, they muſt leave ſome of the corn untouched by them, and then this is only rolling the corn

corn in the common way, as it is only ſqueezed by the roller, and not bruiſed by the irons: ſo far there is no harm done. There muſt be corn, you will ſay, that is cruſhed and bruiſed, if not quite deſtroyed, by the violence of the irons: but ſuppoſing the corn loſt, whereever the irons pitch, which is very far from being the caſe; yet the untouched corn will be ſo improved, by this ſhattering and looſening of the ſoil about their roots, and ſcraping of the mould by the thorn buſh, and ſhaking and tearing the tender blade, that the owner will judge for himſelf, whether the Greek epigram ought to have a place among the paradoxes in agriculture. However, it can do no gentleman much harm to let the roller go down in one place, and up again in another, and give over; and this ſingle trial is all that the author pleads for, and that the weather and ſtate of the ground be ſuch, as will ſafely admit of the experiment.

" The uſe of the roller, in making the fallows, and preparing the ground to a requiſite degree of fineneſs, in the old, new, and what this Treatiſe calls the Semi-Virgilian Huſbandry, is, by this time, pretty evident to the reader, and needs no more inſtances, where ſuch perfection is deſired. We come now to ſpeak of its uſe on graſsland, where the ſwarth is worn out by age, ſpoiled by moſs, or a bad ſort of graſs; or defective in any ſhape, from ſome cauſe or other, and yet it is very dangerous to plough it up, and lay it down better, on account of its ſituation, or it is not convenient, perhaps, for other reaſons, to diſturb it with the plough: whatever the caſe is, the owner, undoubtedly, would be exceeding glad to have a better burden of graſs on the ground, for the maintenance of his live ſtock, or for the pleaſure of ſeeing his ground, about his houſe, put on a better appearance.

" Here, then, there muſt be ſome compoſt prepared; that is, a mixture of the dunghill, ſods, aſhes, lime, mould, ſoap-aſhes, and ſuch like ingredients, or as many of them as can be conveniently procured, laid up in a heap, in this manner: a ſtratum of mould, about half a foot deep, then dung, then ſods, then ſoap-aſhes, then common aſhes, then lime, then dung; and to cover all with mould, about half a foot deep. When theſe have laid ſome time, that the dung may communicate its juice to the ſtrata beneath, the heap may be thrown down with ſpades, ſo as, in the operation, theſe ingredients, being mixed together, the firſt ſtratum, of half a foot, of the new heap, may be compoſed of all the ingredients; and ſo, in like manner, all the reſt of the ſtrata, till the new heap is compleated; and after theſe have laid ſome time, they will be very mellow, and fit for uſe the Michaelmas after the winter when the firſt heap was formed.

" We muſt now ſuppoſe the cloſe, whoſe ſwarth is to be improved, to have been laid down even, and not in ridges; and that between Michaelmas and Martinmas, the ſooner after the former the better, the ground is to be ſo moiſt, as to admit the irons of the ſpiky roller, but not the horſes feet; that is, the irons will penetrate three inches, or thereabouts, and the horſes feet make little or no impreſſions. Here, then, the roller muſt go up and down, till the ſwarth and ground are pretty well broken up: this being done, the ſeeds of clover, trefoil, and ryegraſs, or any other mixed with them, muſt be ſown, in the uſual way, and quantity: then the compoſt muſt be ſpread over the ſeed, ſo as to cover them, and a common barley roller, with a thorn buſh faſtened to it, muſt follow, and the ground ſhut up, leſt cattle ſhould do harm, by treading the ground. A gentleman, making this experiment, will have great cauſe to be pleaſed with what he has done; and will, alſo, ſee the neceſſity of laying down his ground as even as poſſible for the future, that he may increaſe the burden of his graſs, whenever it falls ſhort of a proper quantity, or quality." *Randall's Semi-Virgilian Huſbandry, Append. page* 1.

We have added the figure given of this uſeful inſtrument by the above ingenious gentleman, on Plate XXIV. Fig. 5.

A correſpondent of the editors of the Muſeum Ruſticum, who calls himſelf a clay farmer, has made the following obſervations on the ſtructure and utility of the ſpiky roller.

" Give me leave, ſays he, to communicate, to my brother farmers, a moſt uſeful implement in huſbandry, which has but of late been introduced amongſt us. It is ſo very efficacious, and its powers ſo much ſuperior to all other inſtruments yet contrived for the reduction of ſtrong land, that, I think, there is not any poſſeſſor of ſuch ground (who has no objection to a fine ſeed furrow) that will be without this inſtrument. This laſt autumn it has been of the greateſt utility. For whilſt the neighbouring farmers were waiting for rain, ſo that they might with their own rolls and harrows bring their land to that degree of fineneſs they could wiſh to have their ſeed ſown in: thoſe who were poſſeſſed of the ſpiky roller, (for that is the name of the implement I am going to give ſome faint idea of, as it is impoſſible by letter to make any body more fully acquainted with it) had their fallows in ſuch a degree of fineneſs, as I never before ſaw that kind of land in; and had finiſhed the whole of their ſowing, before the others ever thought of taking their ploughs, &c. into the field.

" To begin then with the beſt deſcription I can give of the moſt complete I have yet ſeen. The roller is of oak, ſix feet three inches long, ſeventeen inches diameter, hooped with iron at each end; the circumference divided into eighteen equal parts, where rows of iron ſpikes are ſet (in the quincunx order) at ſix inches diſtance, one from the other, in the rows: ſo that there are thirteen ſpikes in one row, and twelve in every other throughout the circumference. The number of the ſpikes is two hundred and twenty-five. They are to project four inches and a half from the roller, and to be one inch by three quarters of an inch ſquare at that part of the ſpike next the roll, tapering off to three quarters of an inch by half an inch at the top part. The whole length of the ſpike, with what is driven into the wood, will be about nine inches long. And I would adviſe the falling ſide at the end of each ſpike to have a ſtroke or two with the hammer, that they may be a little more pointed to give them greater facility in penetrating the very hard clots they are deſigned to break. Every ſpike will weigh about one pound and a quarter, which will be of ſufficient ſtrength.

" The frame ſhould be made for horſes to draw a-breaſt, or with a pole for oxen. For by the horſes, &c. drawing double, the roll is more eaſily turned; and, beſides, it is likely to prevent the end of the roller from going over the driver, if by chance he ſhould fall. That it may with greater eaſe and conveniency be conveyed from field to field, or to any diſtance, an axis is fixed upon the frame immediately above the roll with wheels; ſo that by turning the frame, the wheels take up the roll, and away you may drive. And, when you have brought it to the field, in order to make uſe of it, by turning the frame back again, you let down the roll, and then the wheels are carried by the roller.

" Since making of the above deſcription, I have talked with the wheelwright, who tells me, he could greatly improve the manner of fixing the wheels, by making them run within the frame: for as they now run without, it ſets the wheels at ſuch a diſtance, as makes it difficult to paſs through gates made only the common width. And likewiſe ſays, that great care muſt be taken in fixing that part of the frame which the gudgeons of the rolls runs in: for by that means the roll will be let down with greater eaſe; which will not be the caſe, if regard is not paid to that particular. The roller, frame, wheels, &c. are, together, about eleven hundred weight.

" If your land, by once paſſing over it with the roller, is not ſo fine as you could wiſh to have it, let a large harrow be faſtened to the frame of the roller, which will pull up the remaining clots, and thereby give the roller a better chance for breaking of them the ſecond time going over. Four able horſes are equal to this work." *Muſeum Ruſticum, vol.* V. *page* 372.

Theſe obſervations induced the inventor, Mr. Randall, to ſend the following letter to the editors of the Muſeum Ruſticum.

" In your Muſeum for laſt December, ſays he, I obſerve my name mentioned concerning the ſpiky roller. Without making any comment on the clay farmer's dimenſions, for conſtructing this implement of huſbandry, I beg leave to tell him, and the reſt of your readers, that the length of mine, which was the firſt I ever ſaw or heard of, except what the late Mr. Ellis mentioned to ſo little purpoſe, was ſeven feet, the diameters of the ends eighteen

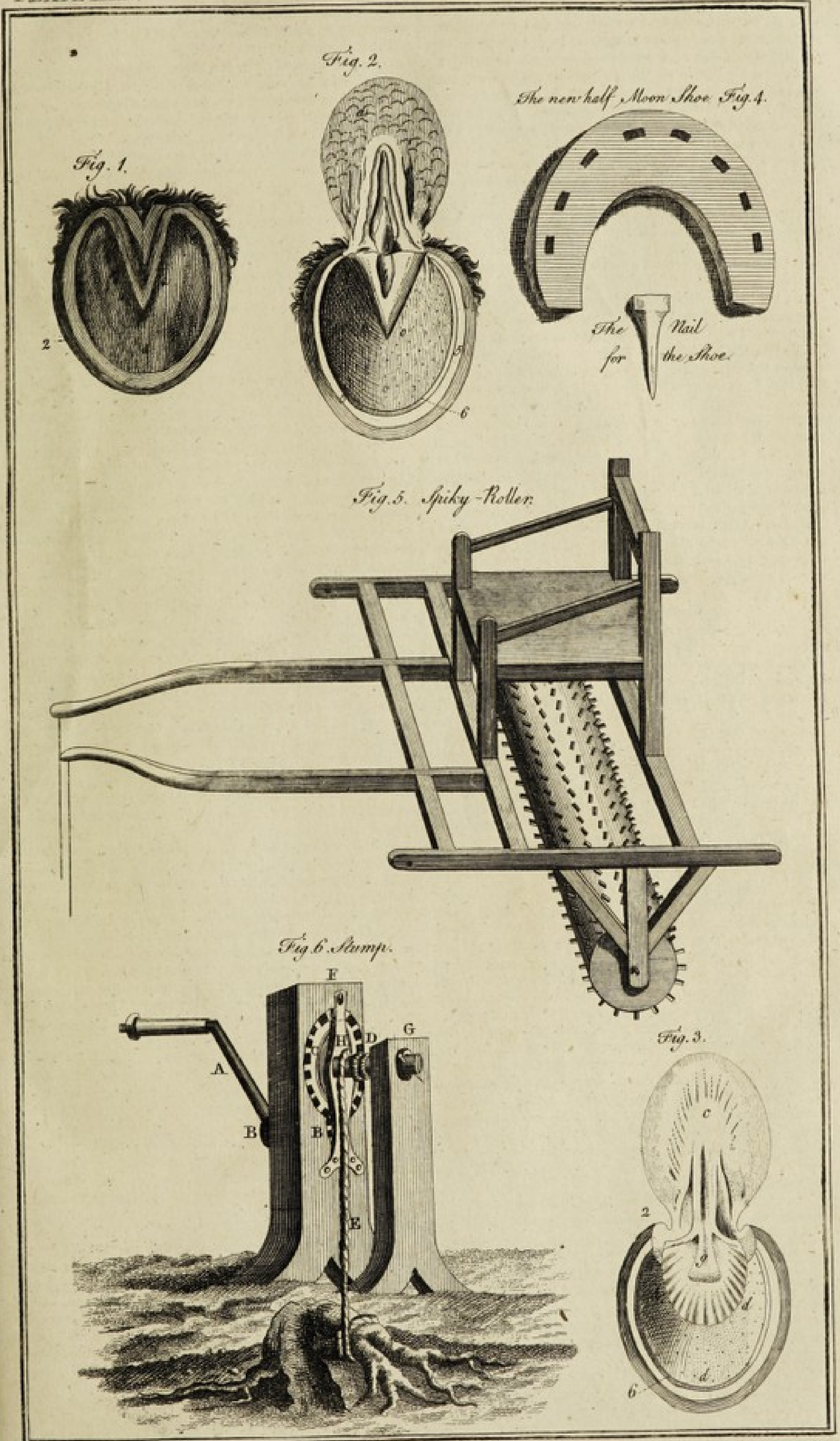
Fig. 1.
2
Fig. 2.
6
The new half Moon Shoe Fig. 4.
The Nail for the Shoe
Fig. 5. Spiky-Roller.
Fig 6 Stump.
F
A
B
B
H
D
G
E
Fig. 3.
c
2
g
d
d
6

teen inches, and the whole cylinder made of the heart of oak: and when the irons were burnt in, and the man feated on the box defigned for that purpofe, the weight of the whole was about a ton. But you will think it ftrange, that the blunt end of the irons were oppofed to the clods, and run more taper, till they came to the furface of the cylinder, into which the irons were burnt, and inferted about three inches: which was their length above the furface of the roller, and which, I always found, very fufficient to crufh the hardeft clod that ever came in their way. Had I, indeed, attempted to go on the ground, when the foil was not perfectly dry, this pofition of the irons would have carried the clods round with the roller: for it is not its province to fqueeze but crufh. Nor indeed can a man do more harm to his ground, than going upon it, when it is not quite dry, with a roller, conftructed according to the clay farmer's form and fize of the irons; or by that which I have recommended. I am fenfible, thofe, who conftruct the roller, according to the clay farmer's directions, imagine, that by inverting the fhape, there is lefs danger of carrying the moift clods round with the roller: but, I muft fay again, there is no occafion for this precaution: for, if the other form be at all neceffary, it muft be in the moift ftate of the ground: which is the only reafon, we fhould keep the roller off the foil. I had the irons fixed in four inches afunder, in the firft row, from end to end. The fecond row began juft between the firft and fecond irons of the firft row. The third row was like the firft; and the fourth like the fecond. Then alternately for the whole furface of the cylinder, as near as could be, the irons were four inches afunder in each individual row, and four inches from row to row, as nearly as the fuperficies of the cylinder would permit. I do not know how to convey a jufter idea to your readers of the fhape of the irons, than to call them ox-harrow-teeth. For when I fent for the workman, I defired him to make fo many of this denomination, fix inches in length; and burn the fmall end three inches into the wood: he went from me, as perfectly underftanding what I meant; brought his number of irons; and inferted them a proper depth into the cylinder. If fome of your fouth-country readers fhould be at a lofs to know what is meant by ox-harrow-teeth, they will be pleafed to remember, that they are irons faftened into two harrows, which are drawn by either four oxen and two horfes, or fix oxen alone, in very ftiff foils. Now, it will appear to you, that the roller itfelf, and one harrow, will require at leaft four able horfes, according to the clay farmer's ftating the cafe: but my roller, without harrows, always ftood in need of three ftout horfes, which the man, from his box, always drove a-breaft, for the greater convenience of turning on the land's ends. But were I to have two ox-harrows, (which would only extend the length of the roller) following the roller, for the purpofe of tearing up clods, in order to be crufhed, on going a fecond time over the fame, feven feet in length, I fhould be obliged to have a much ftronger team than four ftout horfes; and, therefore, I muft beg leave to obferve, for this, an unanfwerable reafon, that harrows are better omitted; as they always were, by my people, who fet in with their ploughs, and turned up the foil from all requifite depths, in order to have it crufhed by the roller going twice in a place.

"If the clay farmer will not take it amifs, I would tell him, that wheels to the roller only create expence and trouble. For I do not remember we ever had any difadvantage from the weight of them in my four rollers, made for near a thoufand acres of land, of all denominations of foils, ftiff and light: for, when the fellows had occafion to convey the roller from one inclofure to another, and fometimes over the hard high road, I never heard, or obferved, there was the leaft difficulty of doing it: as the irons were fo ftout, as not to receive any injury in the paffage, otherwife than by friction; by which they would be indeed in time fomewhat impaired. As to the width of the gates, I think there was never any ftoppage; fince the men, when they found the paffage rather too ftrait, could, by turning the horfes heads, eafily inline the roller on one fide, and by that means wriggle it in, where it was too long for entrance. Let who will be the father, or grandfather of this valuable inftrument of hufbandry, I had reafon to be extremely well pleafed with my lucky hit, in conftructing it from Mr. Ellis's barely mentioning a fpiky roller: though, from his ufual giddinefs, he gave his readers no more than the name. As it is of confequence to the world, to keep the expence of this inftrument as low as poffible, I fhall be very forry to hear any more of wheels; for it may deter farmers from ufing it; and without their hearty concurrence, all will be only playing at farming. Gentlemen may pleafe themfelves in every variation of the implements, and modes of culture: but without the affiftance of thofe, who blefs the nation with their endlefs toil, a thoufand years hence will be as to-morrow.

"Befides the purpofes already mentioned, this roller muft undoubtedly be of ufe in laying, originally, down lawns, or large pieces of grafs required to be level. Mr. Randal only mentions the reftoring fuch when depraved: but certainly this inftrument muft be extremely effectual in the cafe of all ftiff lands, for the producing a good face in the firft forming of fine pieces of grafs. The manner of doing this, in fuch cafes, is too obvious to perfons qualified for executing fuch work, to require any explanation: as the inftrument may be ufed concurrently with any of the common methods of manuring and fowing grafs feeds, as well as with Mr. Randal's compoft, &c. they being no ways particularly neceffary to the effects of the roller, though it may greatly aid them.

"This roller may likewife be very ufeful in preparing clay for the making canals or pieces of water. For where, as fometimes happens, the clay grows dry, and will not admit of being duly tampered for ufe without great pains in breaking it, a very large quantity may very foon be reduced to the requifite finenefs, by fpreading it on hard ground in a due thicknefs, and paffing this roller a few times over it. In very great works, much trouble and labour may be fometimes faved, by this means, where fuch a roller is at hand; and the clay prepared in a manner that will anfwer the purpofe much more effectually.

"It is certainly an inftrument, which no farm, where the land is ftiff, or in the leaft liable to clot, fhould want. For befides the conftant advantage of faving labour, and bringing land to a better condition for any kind of fowing than the plough and harrow with any affiftance of the work of hands can make it, in unfavourable feafons and under fuch circumftances as Mr. Randal has mentioned in the above quotation, the lofs of the whole crop by an otherwife unavoidable delay beyond the feed time, may be with certainty prevented."

We fhall conclude this article with the following ingenious account of the ufes of this inftrument, which we have been favoured with from Mr. John Berington, of Winfley, near Hereford.

"As I live, fays he, in a clay country, and had been often put to a great deal of difficulty in a dry unkind feafon, in reducing the land to a proper tilth, I refolved to make trial of Mr. Randal's fpiky roller; but apprehending great ftrefs muft lie upon the horfe and frame, in turning fuch, as well as tearing up the ground, it occurred to me, that I had feen recommended a double roller, that is, one divided in two parts. It is very probable that you have it already in defign, if not, the following directions I imagine may fuffice.

"Let the ends of each part be bound with narrow but ftrong bands of iron, and let the fpikes at the ends be placed clofe to them; let each part have a feparate frame, but let the cheeks in which the inward gudgeons turn, be made of iron plates, about two inches wide above, and four where the gudgeons enter; the thicknefs, a common flat bar of iron; and thefe fixed, in any firm manner, to two cheeks of wood reaching down juft to the bands, and of fuch a thicknefs at bottom as not to interrupt the fpikes. Let the inward gudgeons be made with quite flat heads, to prevent their flipping out in working; and this brings the two ends of the roller near together, which is of fome little confequence, as the fewer clots will be miffed in working.

"Let the frames be joined together by four eyes, like thofe of a fmall gate, two at one end about five or fix inches apart; the two at the end of the other, to take place juft within them; an iron pin through all four, and keyed. Let the trills be placed juft on the middle of each frame, and a bar of wood juft behind the horfe to ftrengthen ſtrengthen them; the bar ſawed through in the middle, and joined by a ſtrong flat hinge; one ſide made to haſp upon a ſtaple, kept down with a wooden clet. This gives the whole proper play in working; and I may venture to affirm, it will be found, next to the plough, the moſt uſeful inſtrument in tillage, not only in reducing a ſtiff ſoil, but with a buſh at its tail, as Mr. Randal expreſſes it, will cover the ſeed when ſown much more effectually, and in a better manner, than a harrow, as it turns up the earth light and fine behind it; and though ſeemingly unweildy, will turn with eaſe, and may be worked with one, two, or three horſes at moſt, upon any land that is of a proper dryneſs to work upon, of which I cannot well forbear giving you an inſtance: the carter that was to drive it exclaimed, when he firſt ſaw it, that it would kill all his horſes: ſome time after, as he was uſing it upon a piece of fallow, a fellow-ſervant wanted a horſe for ſome uſe, and was going to catch one; the carter called to him, and told him, he might take one of his, having three, as he could do very well with two. Now I believe you will allow, that if it could ſo eaſily overcome the obſtinacy of a clown, there are very few clods that will be too hard for it.

" The ſpikes are about four inches without, and three within the wood; the thickneſs of the roller, and number of ſpikes, I think, may be determined, in ſome meaſure, by the nature of the ſoil it is to work upon."

SPINAGE, a well-known plant, cultivated in kitchen gardens.

It requires a rich, light, and well looſened ſoil. It is propagated by its ſeeds only, of which there are two ſorts, namely, the rough and prickly, which produces the prickly ſpinage with arrow-pointed leaves, and the ſmooth, from which ſprings the ſpinage with oblong oval leaves.

The ſeeds of the firſt of theſe kinds, which is by much the hardieſt, and therefore fitteſt to be cultivated for winter uſe, ſhould be ſown upon an open ſpot of ground, in Auguſt, juſt before a ſhower of rain, if it can luckily be ſo timed: for if the ſeaſon ſhould prove dry for a long while after the ſowing, many of them will not ſprout at all, and the plants of thoſe that do grow will come up ſo irregularly, that half the crop will frequently be loſt. It therefore is highly adviſable to water theſe ſeeds within two or three days after their being ſown, if rain does not fall in the mean time.

When the plants begin to be ſtrong, the ground on which they grow ſhould be well hoed, to deſtroy the weeds, and to thin the plants to the diſtance of three or four inches aſunder. This, like all other hoeings, ſhould always be performed in dry weather, the more effectually to kill the weeds: or, if it be rainy, they ſhould be carried off the ground as ſoon as they are cut up, to prevent their taking freſh root: for if many of them ſpring up, and the ſeaſon prove wet, they will ſtifle the plants of ſpinage, and make them rot. A ſecond careful hoeing is therefore neceſſary in about a month or five weeks after the firſt; and with the help of this the ſpinage will begin to be fit for uſe by the end of October. The beſt way of gathering it is, to crop off only the largeſt outer leaves, and to leave the middle ones to grow bigger: for by this means a regular ſupply may be had during the whole winter, and even till the ſubſequent ſpring ſowing ſhall have produced plants large enough for uſe, which generally is in April. The winter ſpinage will alſo then be ready to run up, and ſhould therefore be entirely cleared off, unleſs a parcel be left for ſeed, if wanted. But if early cabbages, which will want earthing up, have been planted among this ſpinage, as is the uſual practice of the gardeners about London, a ſeparate ſmall ſpot of ground ſhould be allotted purpoſely for ſowing ſome of this ſpinage for ſeed, without any other plants among it, and to cut up all the remains of the other winter crop, as ſoon as the ſpring ſpinage is fit for uſe.

The oblong oval leaved ſpinage, commonly called plantain ſpinage, which has thicker leaves and more ſucculent ſtalks than the former ſort, is ſown in the ſpring, likewiſe upon an open ſpot of fine rich earth. The London gardeners, who always endeavour to have as many crops in a ſeaſon as they poſſibly can, generally mix radiſh ſeeds with thoſe of the ſpinage which they ſow at this ſeaſon: but the beſt way for thoſe who have ground enough, is to ſow their ſpinage ſeeds alone. This crop muſt be hoed, cleared from weeds, and thinned, in the manner before directed for the winter ſpinage; and when the plants, which were at firſt left three or four inches aſunder, have grown ſo as to meet, it will be right to cut them out here and there for uſe, and to thin them in this manner, as they are wanted for the table, till thoſe that are left, ſtand eight or ten inches aſunder. The thinnings in the mean time will give the remaining plants room to ſpread; and if, after this laſt, the ground between them is well ſtirred to a good depth, and kept perfectly clear from weeds, this ſort of ſpinage will frequently produce leaves as large as thoſe of the broad leved dock, and extremely fine.

A ſucceſſion of ſpinage may be had throughout the whole ſeaſon, by ſowing it every three weeks, from about the middle of January to near the end of May; only obſerving, that the earlieſt ſowings muſt be upon the naturally drieſt ſoils, and that the lateſt ſhould be thinned moſt at their firſt hoeing, becauſe the remains of the former crops will furniſh a ſupply till theſe are full grown, and the plants will not be ſo apt to run up to ſeed when they ſtand at a diſtance from each other, as when they are cloſe together.

In order to have good ſeeds of ſpinage, each particular ſort ſhould be ſown by itſelf, in an open ſpot of rich and well dug ground. This ſowing ſhould be in February, as ſoon as the danger of froſt is over; and when the plants are come up, they ſhould be thinned with a hoe till they are ſix or eight inches aſunder every way. All weeds ſhould at the ſame time be carefully cut up and carried off: and in about three weeks or a month after this, the plants ſhould be hoed and thinned a ſecond time. Their diſtance from each other ſhould then be enlarged to at leaſt twelve or fourteen inches: for they will cover the ground very ſufficiently after they have ſhot out their ſide branches. Particular care is requiſite at this time to keep them very clear from weeds; becauſe theſe would make the plants of ſpinage run up weak, and thereby greatly injure them.

Mr. Miller is here extremely judicious in his directions for the farther management of ſpinage intended for ſeed. " When the plants, ſays he, have run up to flower, you will eaſily perceive two ſorts among them, viz. male and female. The male will produce ſpikes of ſtamineous flowers, which contain the farina, and are abſolutely neceſſary to impregnate the embryos of the female plants, in order to render the ſeeds prolific. Theſe male plants are, by the gardeners, commonly called ſhe ſpinage, and are often, by the ignorant, pulled up as ſoon as they can be diſtinguiſhed from the female, in order, as they pretend, to give room for the ſeed bearing to ſpread: but, from ſeveral experiments which I have made on theſe plants, I find that, where-ever the male plants are entirely removed before the farina is ſhed over the female plants, the ſeed which they produce will not grow, ſo that it is abſolutely neceſſary to leave a few of them in every part of the ſpot, though a great many may be drawn out where they are too thick; for a ſmall quantity of male plants (if rightly ſituated) will be ſufficient to impregnate a great number of female, becauſe they greatly abound with the farina, which, when ripe, will ſpread to a conſiderable diſtance, when the plants are ſhaken by the wind."

When the ſeeds begin to ripen, they muſt be guarded from birds; and when they are thoroughly ripe, which is known by their changing their colour, and beginning to ſhed, the plants ſhould be drawn up, and ſpread upon cloths, for a few days, to be completely dried by the heat of the ſun. That they may be perfectly ſo, they ſhould be turned every other day; and when they are quite dry, they ſhould be threſhed out, well cleaned, and laid up in a dry place, where mice, which are exceſſive fond of this food, cannot come at them.

SPINDLING, running to ſeed.

SPILTER, an inſtrument uſed by gardeners in digging the ground; a ſpade.

SPLENT, a hard excreſſence growing on the ſhank bone of a horſe.

Some horſes are more ſubject to ſplents than others; but young horſes are moſt liable to theſe infirmities, which often wear off, and diſappear of themſelves. Few horſes put

put out ſplents after they are ſeven or eight years old, unleſs they meet with blows or accidents.

A ſplent that ariſes in the middle of the ſhank bone is no ways dangerous; but thoſe that ariſe on the back part of this bone, when they grow large and preſs againſt the back ſinew, always cauſe lameneſs or ſtiffneſs, by rubbing againſt it; the others, except they are ſituated near the joints, ſeldom occaſion lameneſs.

As to the cure of ſplents, the beſt way is not to meddle with them, unleſs they are ſo large as to disfigure a horſe, or are ſo ſituated as to endanger his going lame.

Splents in their infancy, and on their firſt appearance, ſhould be well bathed with vinegar, or old verjuice; which, by ſtrengthening the fibres, often put a ſtop to their growth; for the membrane covering the bone, and not the bone itſelf, is here thickened; and in ſome conſtitutions purging, and afterwards diuretic drinks, will be a great means to remove the humidity and moiſture about the limbs, which is, what often gives riſe to ſuch excreſſences.

Various are the remedies preſcribed for this diſorder; the uſual way is to rub the ſplent with a round ſtick, or the handle of a hammer, till it is almoſt raw, and then touch it with oil of origanum. Others lay on a pitch plaiſter, with a little ſublimate, or arſenic, to deſtroy the ſubſtance: ſome uſe oil of vitriol; ſome tincture of cantharides; all which methods have at times ſucceeded; only they are apt to leave a ſcar with the loſs of hair. Thoſe applications that are of a more cauſtic nature often do more hurt than good, eſpecially when the ſplent is grown very hard, as they produce a rottenneſs, which keeps running ſeveral months before the ulcer can be healed, and then leaves an ugly ſcar.

Mild bliſters often repeated, as recommended in the article ſpavin, ſhould firſt be tried as the moſt eligible method, and will generally ſucceed, even beyond expectation: but if they fail, and the ſplent be near the knee or joints, you muſt fire and bliſter in the ſame manner as for the bone-ſpavin.

Splents on the back part of the ſhank-bone, are difficult to cure, by reaſon of the back ſinews covering them; the beſt way is to bore the ſplent in ſeveral places with an iron not very hot; and then to fire in the common way, not making the lines too deep, but very cloſe together.

To SPRAIN SEEDS, ſignifies, to throw them with a ſingle motion of the hand at a certain diſtance from one another.

SPRIG, a ſmall branch, a ſpray.

SPRING, the ſeaſon in which plants vegitate.

Spring alſo ſignifies a fountain, or iſſue of water from the earth. *See the articles* DRAINING, *and* WATER.

SPRING-WHEAT, a ſpecies of wheat ſown in the ſpring. *See the article* WHEAT.

The following experiment and obſervations on the comparative ripening of ſpring and common wheat made by the ingenious Mr. John Wynne, baker, and reported by that gentleman to the Dublin Society, muſt not be omitted here.

" Some little time after receiving the inſtructions I was honoured with from the ſociety, I was deſired by the committee, then ſitting to ſettle the premiums for the ſucceeding year, to make a comparative experiment between ſpring and common wheat.

" The purpoſe of this experiment was to diſcover, whether common wheat would not ripen when ſown late in the ſpring, as well as ſpring wheat.

" Accordingly, on the twenty-eighth day of March, I ſowed two perches of each ſort of wheat in my garden, in drills three feet aſunder, at the rate of five ſtone to an acre. I had but two pounds of ſpring wheat, otherwiſe I ſhould have extended the experiment.

" The common wheat came up well, but the ſpring wheat came up very thin in the drills, which, for ſome time, I apprehended was owing to ſome fault in the ſeed; but the caſe was otherwiſe, as appeared afterwards from a ſecond ſowing in another place: add to this, that in a few days I diſcovered mice had eaten great part of the ſeed; however, ſome little of it eſcaped, and planted greatly, as did the common wheat.

" As a ſubſtitute for the horſe-hoe, which could not be introduced in theſe ſmall experiments, I uſed the ſpade; and the plants grew to admiration.

" The fatality, which attends all ſmall experiments in the corn tribe, followed theſe: for I was obliged to cut the ſpring wheat before it was ripe, the birds, in defiance of all protection, having devoured moſt of it; however, it would have ripened completely, and, as a proof of this aſſertion, I have a few ears, which I ſelected from the reſt, which are very fine.

" It may be proper to obſerve, that the ſpring wheat was more expoſed to the ravages of birds than the other, as the common wheat I ſowed was bearded, which is always a great, though not a perfect, protection to it from birds.

" The common wheat met with a diſtemper which was quite as fatal to it, as the mice and birds were to the other: this was the ruſt, or mildew. Before this diſeaſe came upon it, it was as fine corn as ever I ſaw, but it never ripened; although in appearance the ears were very fine.

" This diſeaſe attacking this corn and ſparing the other, I am inclined to attribute to this circumſtance, viz. that this was very thick and ſtrong; whereas the other was very thin, from the accident before-mentioned: perhaps, had it been as thick, it might have ſhared the ſame fate. So that I think theſe experiments are not by any means concluſive, as to the ripening of either of theſe ſpecies of wheat, when ſown late in the ſpring.

" I ſowed another plot of ground, as was before-mentioned, on the fourth of May with ſpring wheat, which came up well, grew very ſtrong, and formed very fine ears in appearance, but never ripened.

" On the twenty-ninth of April, I ſowed an acre of very good ground with common wheat, which I ſteeped before-hand in putrid water; it came up in eight days, but made no figure till June; it formed ſmall ears, but produced no grain at all.

" So far we have two concluſive experiments that ſpring wheat will not ripen when ſown in the beginning of May; and that common wheat will not ripen when ſown the latter end of April.

" Notwithſtanding that our queſtion is not anſwered by the two firſt experiments; yet the diſeaſe attending the common wheat has furniſhed ſome obſervations with reſpect to the mildew, or ruſt, upon corn and other plants, which tend principally to confirm thoſe made by the ingenious Mr. Tillet, director of the mint at Troys, and ſeem to contradict moſt of our Engliſh writers on this diſeaſe; many of whom ſeem to have implicitly followed others, who, I am afraid, have undertaken to account for, and furniſh remedies againſt, a diſeaſe, which perhaps they had never ſeen.

" Various are the opinions, and many of them contradictory in themſelves: but, upon the whole, candour obliges me to own myſelf as much at a loſs to determine with certainty the cauſe of this diſeaſe, as, I find, the many writers are, who have thought themſelves perfect maſters of it. Even by reading ſix pompous pages, which I have gone over many times, I ſhould ſcarcely know the diſeaſe, ſo faint is the deſcription; but it will ever be known by the greateſt ſtrangers to country affairs under the French name, which indeed is as truly deſcriptive as it is laconic, by them it is called *rouille*, or ruſt. By the Romans it ſeems to have been called *rubigo*.

" I ſhall omit to give my obſervations upon this diſeaſe at preſent, as it would oblige me to quote many tedious paſſages from the books; and where there is a contrariety of opinions, although without evidence: yet, a little man, with a few facts only to ſupport a new theory, would ſtand a chance of making but a poor figure.

" At preſent I join in opinion with Mr. Tillet, and Mr. Reneaume; who ſeem to think that the extravaſated juices of the plants, operated upon, and condenſed, by the acrimony of the air, I ſhould rather ſay incruſted, are the occaſion of it. To this I ſhall only add, that I am at preſent of opinion, that the lacerated parts of the plants giving paſſage to, or rather changing the courſe of, the juices before-mentioned (which are the nutriment and life of the plants) to the diminution, and loſs, of the vegetable food to the nobler parts, is the true cauſe of the

plants

plants failing in their produce: but, I repeat it, I attempt not here to account how, and from what caufe, thofe lacerations, which I believe to be the bafis of the difeafe, happen.

"The comparative experiment between fpring and common wheat, I think, fhould be repeated, as the difcovery thereby fought for tends to a public benefit: but it fhould be in a larger way, and in an open expofure.

"A circumftance has recurred to my memory, which had efcaped my attention from the time it happened, till fince I entered upon this fubject.

"Laft fpring a poor neighbour of mine told me he had loft the feafon for fowing his wheat, for want of money to buy feed, but that, if he could get a barrel of Poland wheat, (as he called it) which was the white cone, he would then fow his ground: accordingly he obtained the feed, and did fow it; but I underftand, upon enquiry, that it produced not a good crop. He fowed it fome time about the beginning of February.

"And yet I am informed there is a gentleman in Scotland, who makes it his conftant practice to fow his wheat in the fpring by choice: and that he intends to publifh a recommendation of that practice.

"The lateft I ever fowed any with fuccefs was the 30th of December; but that was only a fmall experiment."

SPROUT-HILL. *See the article* ANT-HILL.

SPRIT, a fhoot or fprout.

SPUR, a diftemper which frequently attacks rye, and fometimes does damage likewife to wheat. The following remarks will give an idea of it.

"1. The grains which have the fpur are thicker and longer than the found ones, and generally project beyond their hufks, appearing fometimes ftrait and fometimes more or lefs crooked.

"2. Their outfides are brown or black; their furface is rough; and one may frequently perceive in them three furrows, which run from end to end. Their outward end is always thicker than that which fticks to the chaff, and that moft fwollen end is fometimes fplit into two or three parts. It is not unufual to find on their furface cavities which feem to have been made by infects.

"3. When a fpurred grain is broken, one perceives in the middle or centre of it a pretty white flour, covered with another flour which is redifh or brown. Though this vitiated flour has fome confiftency, it may neverthelefs be crumbled between one's fingers. M. Aimen has indeed fometimes found this powder almoft as black as that of fmutty wheat.

"4. Thefe grains, when put into water, fwim at firft, and afterwards fink to the bottom. If chewed, they leave a bitter relifh on the tongue.

"5. The chaff appears found, though what is outmoft is fomewhat browner than when the ears are found.

"6. All the grains of the fame ear are not ever attacked with the fpur.

"7. The grains which have this diftemper ftick lefs to the ftalks than found grains do.

"8. M. Aimen imputes this diftemper to the grains not being impregnated; and affures us that he has not ever found a germe in grains which had the fpur. The fame obferver has collected, in a memoir which he has fent me, feveral reflections and microfcopical obfervations; but I pafs over in filence fuch refearches as are more curious than ufeful.

"9. I fhall not ftop to refute the opinion of thofe who have pretended that fogs, dews, rain, the moifture of the earth, may give this diftemper to rye. But I cannot help faying that M. Tillet thinks, as does alfo M. Aimen, that other plants, befides rye, are fubject to the fpur. M. Tillet has feen, and M. Delu has fhewn me, grains of wheat which had the fpur. The fpur ought therefore not to be confounded with the uftilago or burnt grain: they are two different diftempers: and what feems ftill more to eftablifh this difference, is, that M. Tillet's experiments prove that the powder of the fpurred grains is not contagious like that of the carious or burnt.

"M. Tillet is ftrongly inclined to think that the fpur is occafioned by the fting or bite of an infect, which turns the rye into a kind of gall; and he fufpects a fmall caterpillar of being the caufe of this mifchief. But neither he nor I dare to fpeak affirmatively on this point.

"Dodard, Longius, Fagon, Delahire, Noel, and, lately, M. Salerne, give particular accounts of the difeafes with which numbers of people have been feized in fome years, owing to their having lived upon bread in which there was much rye affected with this diftemper.

"As moft of the diftempered grains are much bigger than the found ones, it is eafy to feparate the greateft part of them by fifting. It is what the peafants of Sologne do, when corn is not dear; but in times of great fcarcity or dearth, they are loth to lofe fo much grain: and then it is that they are attacked with a dry gangrene, which mortifies the extreme parts of the body, fo that they fall off, almoft without caufing any pain, and without any hemorrhagy. The Hotel-Dieu at Orleans had had many of thefe miferable objects, who had not any thing more remaining than the bare trunk of the body, and yet lived in that condition feveral days.

"As it is not in every year that the fpur in rye produces thefe dreadful accidents, Langius is of opinion that there may be two kinds of this diftemper; one which is not hurtful, and the other which occafions the gangrene we have been fpeaking of. It is however probable that there is but one kind of fpur, and that it does not hurt, firft, when fufficient care is taken in fifting the grain; and, fecondly, when only a fmall part of the corn is diftempered. It is alfo faid, that the fpur lofes its bad quality after the grain has been kept a certain time: in which cafe, the reafon why fome peafants are attacked with the gangrene in years of dearth may be, that they confume their crop as foon as the harveft is over." *Duhamel's Culture de Terres.*

SPURRE-WAY, a horfe-way through inclofed lands, and free to any one to ride in by right of cuftom.

SPURREY, the name of a weed common in many parts of England. It feldom rifes above fix inches in height, flowers in the beginning of July, ripens its feeds in Auguft, and is an annual plant.

The beft method of exterminating this weed is by fummer fallows, and cutting it down before it can fcatter its feeds, which are very fmall.

They cultivate two fpecies of this plant in Holland and Flanders for the winter food of cattle, when there is a fcarcity of grafs. It is faid to enrich the milk of cows fo as to make it afford excellent butter; and the mutton fed on it is preferable to that fed on turneps. Hens alfo eat this plant greedily, and it is commonly thought to make them lay an extraordinary number of eggs.

Though this plant cannot, from the lownefs of its growth, afford a very great quantity of fodder, yet as it will grow on the pooreft fand, where no other grafs will thrive fo well, it may be cultivated to confiderable advantage in many places; and by feeding it off the ground, the dung of the cattle will improve the land.

The farmers in the low-countries commonly fow it twice a year; the firft time in April or May, to be in flower in June or July; and the fecond time after their rye-harveft, to ferve their cattle in November and December. The ufual allowance with them is about twelve pounds of feed to an acre.

STABBING *of Cattle*. *See the article* HOVEN.

STABLE, a place or houfe for horfes, &c. furnifhed with ftalls and proper apartments to contain their food, &c.

Nothing conduces more to the health of a horfe than the having a good and wholefome ftable. The fituation of a ftable fhould always be in a good air, and on a firm, dry, and hard ground, that in winter the horfe may go out and come in clean. It fhould always be built fomewhat on an afcent, that the urine and other foulneffes may be eafily conveyed away by means of trenches or finks for that purpofe. As there is no animal that delights more in cleanlinefs than the horfe, or that more abominates bad fmells, care fhould be taken that there be no hen-rooft, hog-ftie, or neceffary-houfe, near the place where the ftable is to be built; for the fwallowing of feathers, which is very apt to happen, when hen roofts are near, often proves mortal to horfes; and the fteams of a hog-houfe, or hog's-dung, will breed many diftempers. The walls of a ftable, which ought to be of brick rather than ftone, fhould be made of a moderate thicknefs, two bricks, or a brick and a half at leaft, for the fake of warmth in the winter,

winter, and to keep out the heat in the fummer. The windows fhould be made on the eaft and north fide of the building, that the north wind may be let in to cool the ftables in the fummer, and the rifing fun all the year round, efpecially in winter. The windows fhould either be fafhed, or have large cafements, for the fake of letting in air enough; and there fhould always be clofe wooden fhutters, that the light may be fhut out at pleafure, by which means the horfe may be made to fleep in the day as well as in the night, when it is judged proper he fhould do fo. Many pave the whole ftable with ftone, but that part which the horfe is to lie on fhould be boarded with oak planks, which fhould be laid as even as poffible, and crofs-wife rather than length-wife; and there fhould be feveral holes bored through them to receive the urine, and carry it off underneath the floor into one common receptacle; the ground behind fhould be raifed to a level with the planks, and it fhould be paved with fmall pebbles. There are two rings to be placed on each fide of the ftall, for the horfe's halter to run through, and a logger is to be fixed to the end of this fufficient to poife it perpendicularly, but not fo heavy as to tire the horfe, or to hinder him from eating; the beft place for him to eat his corn in is a drawer or locker, made in the wainfcot partition, which need not be large, fo that it may be taken out at pleafure to clean it, by which means the common dirtinefs of a fixed manger may be avoided. Many people are againft having a rack in their ftables; they give the horfe his hay fprinkled upon his litter, and if they think he treads it too much, they only nail up three or four boards, by way of a trough, to give it to him in: the reafon of this is, that the continual lifting up of the head to feed out of the rack, is an unnatural pofture for a horfe, who was intended to take his food up from the ground, and makes him, as they exprefs it, withy-cragged. When there is ftable-room enough, partitions are to be made for feveral horfes to ftand in: thefe fhould always allow room fufficient for the horfe to turn about and lie down conveniently, and they fhould be boarded up fo high towards the head, that the horfes placed in feparate ftalls may not be able to fmell at one another, nor moleft each other any way. One of thefe ftalls ought to be covered in, and made convenient for the groom to lie in, in cafe of a match, or the ficknefs of a horfe. Behind the horfes there fhould be a row of pegs, to hang up faddles, briddles, and other utenfils; and fome fhelves for the brufhes, pots of ointment, &c. The other requifites for a ftable are a dung-yard, a pump, and a conduit.

STACK, a large quantity of corn, hay, ftraw, &c. regularly piled up, and generally thatched to defend the contents from the weather.

It is very common, in order to preferve corn in the ftraw, to make it up into ftacks, by which means they often meet with very great loffes by the dampnefs of the ground, which commonly rots and fpoils it, fometimes near a yard thick; and by rats and mice, and other vermin that breed in the ftack, which eat and devour a great part thereof. To prevent both thefe inconveniencies, where timber is plentiful, they fet four, or fix, or more pofts into the ground, according to the bignefs that they defign the ftack, granary, or barn that the corn is to be laid in: on thefe pofts they lay what is the ground-plats of other building, upon which they make a floor, or lay pieces crofs to fupport the ftack: and if they make a barn or granary of it, they erect fides and a roof upon it; but if only a ftack, they cover it with thatch, and the pofts that fupport it, is by fome perfons, covered round with tin near the top, for about a foot or fo in breadth, in order to prevent the mice and rats getting up. But as tin is apt to ruft, and fo to loofe its fmoothnefs, it will not anfwer the defign long; therefore the better to prevent their getting up, is to cover them with Dutch tile, which will always keep fmooth. But in Hampfhire and other countries where they have plenty of ftone, they make their fupporters of two ftones, which is the beft way.

The lower ftone is about three feet high, two feet wide at the bottom, and one at the top; over this they lay another ftone, of about a yard fquare: fome make it of a round form, which is the beft. This prevents not only the mice and rats from climbing up, but alfo the dampnefs of the ground: and this way you may keep corn as long as you will, without much inconvenience or lofs, except what it lofeth in the firft year's fhrinking, and lofs of weight, which is very inconfiderable. Only you muft obferve, that what corn you ftack muft be bound up in fheaves, that fo the ears of the corn may be turned inward, and the ftraw-ends out, which will fave the corn from pigeons, crows, and other fowls, and likewife from the rain that beats on the fides. If your ftack be of wheat, you may lay oats or other coarfe grain on the top of it, under the thatch, the greateft danger of wet being from the top, if any of the thatch fhould blow off. And if you fufpect any rats or mice have got into the ftack, greafe a ftick and thruft it into it; and if there be any, they will gnaw the ftick. The chief inconvenience that attends this way of keeping of corn, is its bulkinefs, and the farmer's wanting of his ftraw to make dung with, and the chaff to give his cattle, &c. *Mortimer's Hufbandry, vol.* II. *pag.* 141.

STACK *of Wood*, a pile of wood three feet long, as many broad, and twelve feet high.

STADLE, the bottom of a corn mow, or hay-ftack. It alfo fignifies a tree fuffered to grow for coarfe and common ufes, as pofts or rails.

STAG-EVIL. *See the article* STAGGERS.

STAGGERS, a difeafe incident to horfes: a kind of apoplexy.

Farriers generally include all diftempers of the head, under two general denominations, viz. ftaggers, and convulfions, wherein they always fuppofe the head primarily affected. But in treating thefe diforders, we fhall diftinguifh between thofe that are peculiar to the head, as having their fource originally thence, and thofe that are only concomitants of fome other difeafe, where the head is affected fecondarily by confent of nerves, the fource of this diforder being in the ftomach, bowels, &c. By this method we fhall avoid many blunders, which would otherwife arife in practice, for want of knowing the true feat of the diforder.

In an apoplexy a horfe drops down fuddenly, without other fenfe or motion than a working at his flanks.

The previous fymptoms are drowfinefs, watry eyes, fomewhat full and inflamed; a difpofition to reel, feeblenefs, a bad appetite; the head almoft conftantly hanging, or refting on the manger; fometimes with little or no fever, and fcarce any alteration in the dung or urine: the horfe is fometimes difpofed to rear up, and apt to fall back when handled about the head, which is often the cafe with young horfes, to which it does not prove fuddenly mortal, but with proper help they may fometimes recover. If the apoplexy proceeds from wounds, or blows on the head, or matter on the brain, befides the above fymptoms, the horfe will be frantick by fits, efpecially after his feeds, fo as to ftart and fly at every thing. Thefe cafes feldom admit of a perfect recovery; and when horfes fall down fuddenly, and work violently at their flanks, without any ability to rife after a plentiful bleeding, they feldom recover.

All that can be done is to empty the veffels as fpeedily as poffible, by ftriking the veins in feveral parts at once, bleeding to four or five quarts, and to raife up the horfe's head and fhoulders, fupporting them with plenty of ftraw. If he furvives the fit, cut feveral rowels; give him night and morning, glyfters prepared with a ftrong decoction of fenna and falt, or the purging glyfter; blow once a day up his noftrils a dram of powder of afarabacca, which will promote a great difcharge, afterwards two or three aloetic purges fhould be given; and to fecure him from a relapfe, by attenuating and thinning his blood, give him an ounce of equal parts of antimony and crocus metallorum for a month; or which is preferable, the fame quantity of cinnabar of antimony and gum guaiacum.

If the fit proceeds only from fullnefs of blood, high feeding, and want of fufficient exercife, or a fizy blood (which is often the cafe with young horfes, who though they reel, ftagger, and fometimes fuddenly fall down, yet are eafily cured by the above method) an opening diet with fcalded bran and barley will be neceffary for fome time; and the bleeding may be repeated in fmall quantities.

help thinking that the quantity of water which falls in rain, would not be more than is requisite to moisten the mixture, and bring on that putrid fermentation which is necessary for the due incorporating and perfecting of the compost. It will, however, be right to have a shade to put over it occasionally, in case the season should prove extremely wet.—Columella informs us, that the Romans covered their stercoraries with hurdles; but does not speak of covering them with mould, as here directed.

The pit being thus prepared, the farmer's next study should be to fill it with a compost suited to the nature of his land. Thus, if his soil is a strong clay, a layer of dung should be covered with a layer of sand, rubbish of old houses, or other substances already mentioned for the improvement of clay. Litter of all kinds becomes a good addition, because it is slow in decaying, and if mixed with the clay, keeps its parts asunder. The compost for meliorating clay may be carried out, and mixed with the earth, fresher than for any other soil; because, in this state, it will more effectually keep the particles of the clay separated; and if some degree of its putrefaction is carried on in the soil, it will much more powerfully open it.—If, on the contrary, the soil is sand, the dung should be mixed with clay, scouring of ponds, or other fat slimy substances, which may give consistence to the sand. And if the farmer is happy in a soil in which neither of the extremes prevail, he may then mix his manure with the richest mould he can find, and incorporate them well together, by frequent turning, before the compost is carried to the field.—Columella thinks they are slothful husbandmen, who, in thirty days, have not a load of dung, of twenty bushels, from each of the lesser cattle, and ten loads from each of the larger sort, by means of judicious mixtures with their dung. He thinks this mixture, or compost, most beneficial to corn, after it is a year old; because it still retains all its strength, and does not then breed weeds.

"Many good effects, says Dr. Home, particularly that of hindering the oils from being volatilized, and of fixing them, will arise from a mixture of lime with these composts, after they are thoroughly rotted. But as many experiments have proved that quick-lime powerfully resists putrefaction, it does not seem judicious to mix it with dung-hills which are not sufficiently putrefied, as it must stop that process."

"There is a very great attraction betwixt quick-lime and all oily bodies. It unites intimately with expressed oils. With this intention it is used in the manufacture of soap, to help the junction of the alkaline salts and oils. It must, therefore, attract the oils powerfully from the air and earth, dissolve them, and render them miscible with water: it must, from this reason, soon exhaust the soil of all its oleaginous particles, if the farmer does not take care to supply them by dung or animal substances. Farmers have, by experience, discovered it to be gare at impoverisher of lands; but they did not know how it acted. Its operation is, to exhaust the earth of its oils. The proper cure for this is, to mix dung with the lime, so that it may have something to act on."

"Lime is a great dissolver of all bodies, both vegetable and animal; but particularly the latter. We know how soon it reduces hair and woollen rags into a pulpy substance. This effect is so strong, that, in the common method of speaking, it is said to burn them. In this way it certainly operates in the earth, by dissolving all animal and dry vegetable substances, and converting them to the nourishment of vegetables, at least sooner than otherwise they would be. Like other calcarious bodies, it is not dissolvable but by acids. With these, a great effervescence happens, a solution of the calcarious body is made, and a neutral salt is formed from that conjunction. This neutral salt is always soluble in water, unless where the acid of vitriol is used." *Home's Principles of Vegetation, page* 69, 70.

The Society of Improvers in the Knowledge of Agriculture in Scotland, have paid great attention to the subject of composts, and are very particular in their instructions on this head, to several of their correspondents. I gladly take this opportunity of paying the tribute of praise justly due to their public spirit, and congratulate them on the great success which has attended their labours in many parts of their country. At the same time I cannot help regretting, that, though all our neighbours have set us so many examples of periodical instruction in this most useful art, there is not yet any institution of that kind in England. It is to be hoped, that the Society for the Encouragement of Arts, Manufactures and Commerce, will soon take off this reproach, and not suffer it to be longer said that agriculture lies neglected in this kingdom, where the people enjoy every advantage requisite to promote it, in a far higher degree than the inhabitants of any other country in the world. The wealth of our farmers is incomparably greater; their property, and the tenure of their land, are infinitely better secured; and the happiest of soils and climates combine to reward their labour.

The Society in Scotland give to a gentleman who had written to them, and who had clay and lime at command, the following judicious directions for collecting a compost, or making a stercorary, for the improvement of a sandy soil. "Take, say they, in the field intended to be manured, a head-ridge, the most conveniently situated for a stercorary. Plow it two or three times, as deep as can be, in the cleaving way, if the ridge be high gathered, and harrow it well: then lay thereon your slimy clay, about a foot thick, leaving a part of the ground un-covered: next lay a thin layer of dung, another of clay, and after that a layer of un-slaked lime, at least a foot thick: then throw up the earth left uncovered on each side. After this, repeat another layer of clay, and lime-stone, as before, and finish it with a layer of clay and sea-wreck, covered with earth. The more of the slimy clay the better: for though it may be cold, yet it will not be the worse for a sandy hot ground. If you examine the clay, we doubt not but you will find it a very fat substance; being, as we conjecture, mostly muscle and other shells mixed with earth, brought by the tide and river Southesque. On the coast of Lothian, we found that slimy substance to be nothing else; and if it be so with you, it is certainly one of the best manures."

"After this stercorary has stood six weeks or two months, incorporating and fermenting, turn and mix it; and that this work may be performed to the better purpose, and with as small an expence as possible, yoke your plow, enter upon your stercorary with a cleaving furrow, and continue repeating the plowings the same way, until the very bottom of the stercorary be ripped up; then harrow it: it is impossible to over-do it. If it be very cloddy, it should be harrowed between the plowings. Begin then in the middle, and plow again and again in the gathering way, until it be brought into as narrow bounds, and be raised as high as possible. Let all that the plow has left be gathered up, and thrown with shovels on the top. Every such turning and heaping occasions a new ferment, and improves the manure. If the seeds of barley, or of any other quick-growing vegetable, were sprinkled thin on the stercorary, and the plants buried in it, when fullest of sap, before they come to seed, by turning or more heaping, the manure would be improved." This might be repeated several times in the course of the season; for the practice has been found successful. *Maxwell's Collection, page* 26.

In another place, they observe that such a stercorary may be turned in the same manner as ground is trenched. The higher it is raised, the better. Each turning will make it heat like a garden hot-bed, and this fermentation will reduce it to a fine fat mould. If the first heat should go off (which may easily be known by thrusting a pole into it) before it has produced this effect, it may be turned over again, and will take a new heat, which is of great advantage to it, besides the better mixing of the several manures. About fifty or sixty cart-loads of this compost are used upon an acre of ground. I have been the more particular in extracting this account, because any farmer, by attending to the rules here given, may suit his compost to the nature of his soil. Where the soil varies, he will do well to have another stercorary, properly composed, in a convenient part of the field he intends to manure.

The same society, in their directions for the management of sheeps dung, where the sheep are housed, or fed under cover during the inclemency of the winter, advise laying under them substances suited to the nature of the soil

soil intended to be improved. A layer of sand, for instance, for stiff land, will be greatly benefited by being covered with a couch of litter in the sheep-house. When their dung becomes troublesome or offensive to them, or begins to make them dirty, the whole should be removed to the stercorary. But if the dung of the sheep is to be laid on a sandy soil, clay, or any such substance, though covered with litter it would soon become wet, and too cold for the sheep to lie on. It would therefore be better, in this case, to spread a thick couch of litter under the sheep, and mix this in the stercorary with the lime, &c. by which means the same advantage may be obtained, without injury to the cattle. If loam, or a rich mould, be laid under sheep, the judicious farmer will be careful to collect a sufficient quantity of it, when it may be got dry, in the summer. Whatever is used for this purpose, should be renewed as often as it is sufficiently impregnated by the urine and dung of the sheep.

The well preparing of mixed dung, is, as Mr. Worlidge rightly insists, a piece of husbandry by no means to be neglected; for the more and better the dung is, the greater will be the crop; and an increase of the crop will augment the quantity of dung. On the contrary, a decay in the dung makes a decay in the crop, &c. The rise, or fall, of the value of many farms in this kingdom must therefore necessarily depend upon the good or bad management of this essential part of husbandry. *See the article* Dung-Hill.

STERILE, barren, unfruitful.

STEW, a small kind of fish-pond, the peculiar intention of which is to maintain fish, and keep them for the daily uses of a family.

STOCK, the trunk or body of a fruit-tree, into which the graft, or bud is inserted.

All stocks for fruit-trees should be raised from the kernels or stones of the fruit; for suckers (though some people use them), besides being hardly ever well rooted, are very apt to produce quantities of other suckers, which weaken the trees exceedingly, and become very troublesome in the borders and walks of a garden. The best way therefore is to sow a few stones and kernels annually, or at least every other year, for a constant supply. Both these sorts of seeds are best when their fruit has been suffered to hang upon the tree till it drops through ripeness, and is afterwards permitted to begin to rot: but they must be carefully taken out before that rottenness can affect them. They should then be well cleared from the pulp, and the largest, plumpest, and heaviest should be selected, and carefully laid up in dry sand, in a place where neither vermin nor moisture can come to them; for the latter would spoil their growth by rendering them mouldy, and the former, particularly rats and mice, are so very fond of the kernels of apples and pears, that they will even scratch them up after they are sown, and then devour them. Traps should therefore be set in the seminary, to catch those mischievous animals.

Layers, slips, and cuttings, when they have taken good root, make far better stocks for grafting on, than any suckers; but still they are much inferior to those which are raised from seeds.

The best stocks for each sort of fruit are the following.

For apples, which must always be grafted upon a free stock, that is to say, upon a stock of their own kind, for they will not take upon that of any other fruit, the sorts most generally used are, 1. The crab stock, as it is commonly termed; 2. The Dutch creeper; 3. The Paradise stock; and, 4. The codlin stock.

The first of these, called likewise free stocks, are usually raised from the kernels of all sorts of apples taken indiscriminately from the cyder-press; and as all the trees of this species are, without distinction, termed crabs before they are grafted, these are called by the general name of crab stocks: but the best, particularly for such apple trees as are intended for standards, are raised from the kernels of real wildings, or crabs, which have been pressed for verjuice; for these are always cleaner, freer from canker, more durable, and less luxuriant in their growth, than any that are raised from the kernels of finer and sweeter apples. They also produce the firmest, most juicy, and best tasted fruit, as well as the fittest for keeping, and will preserve the sorts grafted upon them in their true size, colour and flavour, far better than any of the other sorts of free stocks. These last will, indeed, produce larger fruit; but it will not be so well tasted, or keep near so long. For winter apples in particular, the true crab stock is incomparably the best. In short, it is remarkably with this, as it is with all other fruits, that, the sourer the stock is, the better its produce will be.

The second sort of stocks for apples, called the Dutch paradise apple, Dutch stock, or Dutch creeper, is generally preferred for espaliers, or dwarfs, because it is easily kept within the compass usually allotted to those trees, without stinting the graft too much; nor does it decay, or canker, near so soon as the third sort, commonly called the dwarf paradise apple, which is now raised only for very small gardens, or for the curiosity of setting an apple-tree upon the table with its fruit upon it, which never is at all numerous.

Codlin stocks are used by some, in order to stint the growth of their grafts: but as they never produce firm or lasting fruit, they should be absolutely rejected, at least for all winter apples, and especially if they have been propagated by suckers, as is the common way. Even the codlin tree itself is so much improved by being grafted upon a crab stock, that it becomes much more durable than it would otherwise be, ceases to put out suckers, and produces firmer and tarter flavoured fruit, which is also much fitter to keep.

November and December are proper times for sowing the kernals of apples in dry ground; but where the soil is wet, it is best to wait till February. The most regular and most convenient way of sowing them, in order to facilitate the taking up of the plants, is to drop them, but not too close together, in little channels opened across the bed, (which, it is taken for granted, has been well dug, raked, and properly prepared as before directed), and then to cover them with about half an inch deep of the same mould. The plants will come up in the spring, when they must be carefully weeded; and if the season should prove dry, it will be right to water them twice or thrice a week. The weeding of them must be continued during the whole summer, lest they should be choaked, or stinted in their growth; and if they thrive well, they will be fit to transplant into the nursery the next October; at which time the ground that is to receive them should be dug again thoroughly, and carefully cleared from all weeds.

The best stocks for all sorts of firm winter pears are raised from the kernels of the fruit of which perry has been made, or from the seeds of some of the strongest and quickest growing summer pears, such as the lady's thigh, and the Windsor. These kernels, if saved as before directed for apples, and afterwards sown, in the same manner, early in the spring, will come up in about six weeks; and if the plants thus produced are kept clear from weeds, they will be strong enough to remove from the seed bed into the nursery in the ensuing month of October. But for all sorts of soft melting pears, which are in general the summer and autumn fruits, quince stocks are preferred, especially for a strong soil, or for such trees as are designed for dwarfs or walls; because the luxuriancy of their growth is checked by these stocks, and their shoots are more easily kept within due compass, than they can be when grafted upon free stocks. They must not, however, be used indifferently for all sorts of pears; first, because there are some which will not thrive upon them, but will decay in two or three years, or at most but just keep alive; and secondly, most of the sorts of hard, or winter pears, are rendered stony by being grafted on a quince stock: besides which it is to be observed, that no sort of pear will do upon quince stocks in very dry and gravelly ground. These stocks are often propagated from suckers, which may be obtained in great quantities, by cutting down an old quince tree; but, for the reasons before assigned, they are not near so good as those which are raised from well rooted layers or cuttings.

The white thorn was formerly used as a stock to graft pears on; but it is now almost totally laid aside for that purpose, because it never keeps pace in its growth with the fruit grafted or budded upon it; and also because the fruit which it produces is generally dryer, and more apt to be stony, than that which grows upon pear stocks.

Cherries do best when grafted upon stocks raised from the stones of the common black, or wild red cherry, both of of which are ſtrong growers, produce clean ſtocks, and are more laſting than any of the garden kinds. Theſe ſtones, collected from the ripeſt and almoſt rotten fruit, may be ſown in the autumn in a bed of light earth; or they may be kept in ſand till the ſpring, and be ſown then. The plants produced by them muſt be kept carefully clear from weeds, and watered from time to time in dry weather, as before directed. They ſhould remain in the ſeed bed till the ſecond autumn after ſowing, and will then be fit to tranſplant into the nurſery, in October. Stocks of the Corniſh, and of the Morello cherry, likewiſe raiſed from the ſtones, have alſo been uſed with ſucceſs, to render the trees more fruitful and leſs luxuriant in their growth; for in theſe laſt reſpects they have nearly the ſame effect upon cherries, as the paradiſe ſtock has upon apples.

Plums will not do upon any but plum ſtocks, the beſt of which are raiſed from ſtones of the freeſt growing ſorts, ſuch as the muſcle, the white pear-plum, &c. Theſe ſtones ſhould be ſet in autumn, about three inches deep and four inches aſunder, in a bed of light dry earth, which it will be right to cover in the winter with a little dry ſtraw, or haulm, to protect them from the froſt; for that would deſtroy them, if it were to penetrate deep into the ground. Their plants will come up the next ſpring, when the covering of litter ſhould be carefully removed; and if they are watered ſparingly now and then in the ſpring and ſummer, and kept conſtantly clear from weeds, they will be fit to remove from the ſeminary into the nurſery in the then enſuing ſpring, or, which is more eligible, in the following autumn.

All the late, or autumn peaches, which are the hard ſorts, and all nectarines and apricots, ſucceed beſt upon ſtocks of the muſcle, or of the white pear-plum, raiſed from the ſtone; though any of the large growing plums, whether white or red, will afford very good ſtocks for theſe fruits. Some recommend almond and apricot ſtocks for the early, or ſummer peaches (commonly diſtinguiſhed by the appellation of melting peaches), which will not grow upon plum ſtocks: but the almond ſtocks are ſo tender in their roots, ſo apt to ſhoot too early in the ſpring, and of ſo ſhort duration, that the preference is deſervedly given, for theſe kinds, to the apricot ſtock, upon which they will take perfectly well, without being near ſo ſubject to blight, as upon the almond. Theſe ſtocks are raiſed, and managed, in the ſame manner as thoſe of the plum. They are particularly proper for all ſorts of peaches which are planted in a dry ſoil; becauſe the peach ſeldom does well in ſuch ground, if it be grafted on any other ſtock; but the apricot will thrive there exceedingly. For this reaſon, the common practice of the nurſery gardeners is, to bud the plum ſtocks either with apricots, or ſome free growing peach, and after theſe have grown a year, they bud the tender ſorts of peaches upon their ſhoots; by which means many ſorts ſucceed well, which would ſcarcely keep alive in the common way. The gardeners term theſe double worked peaches.

The ſtones of peaches are not worth ſetting for ſtocks to inoculate, unleſs it ſhould be for almonds; becauſe the plants which they produce are of a ſpungy nature, and will neither laſt, nor bear tranſplanting. They may indeed, produce ſome new ſorts of peaches, if they are neither budded nor grafted (for all the varieties of fruits have been originally obtained from their ſeeds); and theſe may be better ſuited to our climate, than ſuch as are brought from warmer countries: but ſo few fruits raiſed in this manner prove better than thoſe from which the ſeeds were taken, that they ſeldom make amends for the trouble of rearing them.

STONE-BREAK, or Engliſh ſaxifrage, a perennial plant common in paſture grounds. The root has a ſharpiſh and aromatic taſte. The ſtalks are round, ſtreaked, and reddiſh towards the bottom. The leaves are ſmooth, of a dark green, and divided twice into long, narrow, ſharp ſegments. The foot-ſtalks are membranaceous at the baſe. The flowers grow in looſe umbels; and of a pale yellow colour. The ſeeds are oval, ſtreaked, and red at the top.

"Every farmer, ſays a correſpondent of the editors of the Muſeum Ruſticum, knows which ſort of graſs he would wiſh to have predominant in his meadows: it would ſurely be very eaſy for him to ſave ſome of the ſeeds of ſuch graſs, and propagate it a-part till he had ſaved ſufficient to ſow, ſuppoſe an acre of land with it, pure and unmixed: when arrived at this point, he might propagate it as extenſively as he thinks proper.

"I muſt not however forget the chief intended ſubject of my letter, which is, to recommend to your readers the ſaxifrage as a plant proper to be intermixed with the graſs of their meadows.

"I have now in my holding above thirty acres of meadow land, which fortunately for me bear a graſs that needs no improvement; though this I in part attribute to my having drained my land properly ſome years ago, ſince which the bite is much improved.

"Amongſt this graſs in my meadows there grows a conſiderable quantity of ſaxifrage; which, in the opinion of all the dairy-men in my neighbourhood, is the reaſon my cheeſe is ſo particularly good.

"Now I ſhould imagine that when a farmer has plowed up a foul meadow, and intends ſowing it with good graſs ſeed, it would be no difficult matter to procure a ſprinkling of ſaxifrage-ſeed to mix with it: this would certainly be of ſervice; and we ſhould not deſpiſe this excellent plant becauſe it is common, and not far-fetched: there is great plenty of it in the Netherlands, in their fineſt cow-paſtures; and that I have often heard aſſigned as a reaſon for their having ſuch quantities of cheeſe of a ſuperior quality; though I muſt at the ſame time own, I have in London taſted ſome Dutch cheeſe, ſtuffed full of cloves, which was not the beſt in the world; but this might have been an accident, for they ſay their cheeſe is in general excellent.

"But, to return to my immediate ſubject, I would by all means recommend the propagation of the ſaxifrage plant in meadows, not only on account of its great uſe in improving the quality of cheeſe, and butter alſo, which it does, but becauſe it is a native of our iſland, and there is no danger of its ſucceeding to the farmer's wiſh; which cannot be ſaid of every plant recommended for cultivation.

"But it muſt be remembered, that I do not recommend it to be cultivated alone; I never tried it in that manner: that it will thrive very well when mixed with good meadow graſs, daily experience convinces me; and this method it is I urge." *Muſeum Ruſticum, vol.* I. *pag.* 472.

The burnet, cultivated to ſo much advantage by Mr. Roque and others is a ſpecies of the ſaxifrage. *See the article* BURNET.

STONE, a hard ſolid body, neither molliable, fuſible by fire, nor ſoluble in water; formed by ſucceſſion of time in the bowels of the earth.

M. Tournefort ſuppoſes that ſtones vegetate; but M. Geoffray accounts for the origin and formation of ſtones in a different manner. He lays it down as a principle that all ſtones, without exception, have been fluid; or, at leaſt, a ſoft paſte, now dried and hardened: and on this principle he examines the formation of the different kinds of ſtones, and ſhews that the earth alone is ſufficient for the ſame, independant of all ſalts, ſulphurs, &c.

It has been argued, and is not yet determined, whether ſtones are hurtful, or beneficial, to arable lands. Examples are not wanting on both ſides of the queſtion; though, in general, it ſeems rather to be carried for them. However, nothing can excuſe leaving a ſtone in any ground ſo large as to interrupt the plough. If they are very large, they ſhould be blown to pieces with gun-powder, and then be carried off. Some ſpots, very fertile in ſeveral kinds of grain, ſeem to conſiſt of nothing but ſtones; and inſtances are given of fields being rendered barren by taking away the ſtones which covered them. Theophraſtus accounts for this in a hot country, where it happened to the Corinthians, by ſaying, that the ſtones ſhelter the earth from the ſcorching heat of the ſun, and thereby preſerve its moiſture. The ſame holds true even in our colder latitude, where the heat of the ſun is leſs apt to hurt us; and Mr. Evelyn is clearly of opinion that huſbandmen rather impoveriſh, than improve, thoſe grounds which are almoſt covered with ſtones, eſpecially where corn is ſown, if they pick them off too minutely; becauſe they thereby expoſe the land too much to the effects of heat and cold. Certain it is, that a moderate mixture of ſmall gravel preſerves the earth both warm and looſe, and prevents too ſudden exhalations. But it ſeems highly probable that there muſt be ſome farther reaſon, beyond what has yet been aſſigned, for the benefit ariſing from ſtones. The example already given of the ſtone uſed in Oxfordſhire; and a remakable incident which happened to M. Du Hamel, give great room to think that the ſtones which are thus beneficial, are of the lime-ſtone or calcarious kind.

" The ſtone which is uſed for building at Denainvilliers, ſays M. Du Hamel, is very hard. It bears poliſhing like marble; and is here and there intermixed with ſhells, ſome of which are filled with a kind of oaker, and others contain a cryſtaline ſubſtance. This ſtone is very fit to make lime of. Some workmen, who were building about our houſe, cut pieces of this ſtone upon a graſs-plat. When they had done their work, the rubbiſh was cleared away, and nothing was left upon the graſs but the duſt and very ſmall fragments, which had fallen from the ſtones in cutting them. The next year, the graſs grew ſurpriſingly thick in all the places where theſe ſtones had been cut, was much taller and greener than any where elſe, and preſerved its vigour for ſeveral years. One would ſcarcely have thought that ſo hard a ſtone, reduced to powder would have produced an effect like that of marle. The goodneſs of lime, as a manure, is, perhaps, chiefly owing to the fineneſs of the powder, to which the lime-ſtones are reduced by calcination.

" This fact may help to clear up another, which cannot have eſcaped the notice of thoſe who attend to the differences of ſoils. They muſt have obſerved ſome grounds ſo thickly covered with ſtones, that ſcarce any thing elſe is ſeen after a heavy ſhower of rain. Yet ſome of theſe lands are very fertile, and produce fine wheat. I know not whether I am miſtaken; but I think I have obſerved that this fertility is found only in fields where thoſe ſtones are calcarious. It is very probable that the duſt which is formed by the mutual rubbing of theſe ſtones contributes to that fertility." *Culture des Terres, tom.* V. *pag.* 220.

The farmer may eaſily inform himſelf whether this be the caſe; and if it is, he has a certain rule to go by in the management of ſtones; viz. by trying with aqua fortis, or ſpirit of ſea-ſalt, as mentioned before, whether they are calcarious or not: for every ſtone on which the ſpirit does not efferveſce, is of no uſe, and therefore ſhould be removed, as an impediment to the neceſſary labour. However, the prudent huſbandman will make the experiment of clearing his land, firſt on a ſmall ſpot; that he may be ſure of the ſucceſs, before he embarks in a greater expence. *See the article* LIME.

STONE, alſo denotes a certain quantity or weight of ſome commodities.

A ſtone of beef at London is the quantity of eight pounds; in Herefordſhire, twelve pounds; in the north ſixteen pounds.

A ſtone of wool, according to a ſtatute made in the eleventh year of the reign of Henry VII. is to weigh fourteen pounds, but in ſome places it is more, in others leſs; as in Glouceſterſhire fifteen pounds, in Herefordſhire twelve pounds.

A ſtone, among horſemen, is the weight of fourteen pounds.

STONY-LANDS, ſuch as are full of flints, pebbles, or ſmall fragments of free ſtone.

Theſe lands, in many places, yield good crops, and the general rule is, that in ſtiff and cold lands the ſtones ſhould be as carefully picked out as poſſible, but in light and dry grounds they ſhould be left. In Oxfordſhire they have great quantities of a lean earth, and a ſmall rubble ſtone, or a ſour ſort of land mixed with it; this is ſometimes very full of weeds, and ſometimes very clear of them. If they are weedy they fallow them late; but if they are ſcary, as they call it, that is, if they have a ſward upon them, they either fold them in winter, and add ſome hay-ſeed to the ſheep's dung, to bring up the graſs; or elſe they lay old thatch or ſtraw, and dung upon it: for they reckon that if thoſe lands have no ſward upon them before they are fallowed, they will by no means be brought to bear a good crop, but a great deal of May-weed, and other uſeleſs weeds. In September, November, and December, they fallow as the ſward directs them: if this be done in either of the two laſt months, they call it a winter fallowing; and never ſtir it again, till they plow it, and ſow it with barley; and thoſe lands are reckoned to do better than if finely tilled. They will bear wheat and meſlin in a kindly year, and large crops of barley, if they are well managed, and kept in good heart.

They always fallow theſe lands every other year, unleſs they ſow peas upon them; ſometimes they ſow them with lentils; and, when they are quite worn out, they lay them down for clover or rey-graſs.

STOOKING, SHOCKING, *or* STACKING, the ſetting the ſheaves into ſhocks, the better to guard it from the rain.

A correſpondent of the authors of the Muſeum Ruſticum, has given us the following method of ſtacking, or ſtooking corn to preſerve it from the wet, and in which ſituation it may remain in the field ſix weeks or two months, without any danger from the inclemency of the weather.

" They ſet one ſheaf upright with the ears uppermoſt; and round that they place a circle of many other ſheaves, with their ears uppermoſt, inclining on the firſt ſheaf; and when ſo placed they look like the figure of an extinguiſher.

" Then they lay an horizontal circle of ſheaves, with all the ears in the center, and cover thoſe ears with a looſe ſheaf or two.

" Thus placed they are protected from all wet, and may remain in the field ſix weeks, or two months, as ſafe as in a barn; and this method of ſtacking has been adopted in Suſſex, Surry, Kent, and many other ſouthern counties, to the great benefit of the farmers and the public." *Muſeum Ruſticum, vol.* II. *page* 35.

In a ſubſequent number of the ſame work, the rev. Mr. Comber, of Eaſt-Newton, in Yorkſhire, has made ſome remarks upon the above method of ſtooking, and alſo deſcribed the method followed in Yorkſhire.

" It is to be wiſhed, ſays he, that this gentleman had been more particular in his account. He does not tell us whether this ſtack, as he calls it, is made immediately after the wheat is gathered, or after it has had field-room in ſome other manner, though this circumſtance is very material towards a right judgment of its uſefulneſs, and even of the expedition. He does not tell us, whether by a circle of many other ſheaves he means a circle of one row of ſheaves, or of more, though this circumſtance too is very material.

" I will now give a ſhort, but, I hope, ſufficient deſcription of the method of ſtooking uſed in Yorkſhire, &c.

" Ten ſheaves are diſpoſed in two rows, each row leaning againſt the other: then two ſheaves are laid on the top, ſo as to meet at the centre with their tails, and to ſlope downwards.

Now to compare the methods, I muſt obſerve, firſt, that in your correſpondent's the ſheaves appear to be ſet ſo cloſe as to exclude a free courſe of air, moſt eſſential to give, preſerve, or reſtore, dryneſs to corn; whereas in ours, the air has a free courſe, whether it bear againſt one or other end of the ſtook, or even againſt either ſide of it.

" Secondly, in your correſpondent's method, only ſome looſe ears are laid as a cover to the whole ſtook; and thoſe cannot reaſonably be ſuppoſed long to reſiſt the beating of the rain, but to tranſmit it to all, or many of the ears below them, which they are ſuppoſed to cover: and if we conſider what violent winds often viſit us in, and ſoon after, the harveſt, we ſhall readily allow, that theſe looſe ears may reaſonably be expected to be blown off, and become no cover; nay, to be blown about and away, and often totally loſt; whereas, in our method, the cloſeneſs and weight of two of the beſt ſheaves in the twelve may reaſonably be ſuppoſed to be a good cover, and to continue ſo, and hardly to be blown off by any wind, if carefully laid on; at leaſt, not to be blown away, but ſo as ſoon to be replaced.

" Thirdly, the flat poſition of your correſpondent's cover, muſt make it liable extremely to receive all the rain that deſcends, and tranſmit it to what lies beneath; whereas the ſloping poſition of our cap ſheaves, neither expoſes them to receive directly, nor to retain, nor tranſmit the rain to the corn below, but to throw it off, eſpecially as the tails of the sheaves, in which the straw is thickest and strongest, receive the most of the rain, which can do them little or no harm, and especially if the tails of these sheaves be thrust closely together. In short, gentlemen, your correspondent's method seems to threaten that dreadful malady, mow-burn, whilst ours gives the corn all possible guard against it, viz. access of sun and wind.

"It is of great consequence to the public, as well as individuals, to guard against every species of destruction to so valuable a crop as wheat is, in every stage, but more especially in its last, in which almost all the expence is over: therefore, the above gentleman's assertion, that his method of stacking is adopted in Sussex, Surry, Kent, and many other southern counties, made me more solicitous to examine it; and since, on a fair comparison with our Yorkshire method, it appears to have every disadvantage, I persuade myself I am doing my duty to my country by shewing to many counties a much better method than that which they have adopted. *Museum Rusticum, vol. II. page* 250.

STOOMING *of wine*, is the putting bags of herbs, or other ingredients into it. *See the article* WINE.

STOOP, a post fixed in the earth.

STOT, a young bullock; a steer.

STOVES, in gardening, are buildings erected for the preservation of tender exotic plants, which will not live in these northern countries, without artificial warmth in winter. These are built in different methods, according to the ingenuity of the artist, or the different purposes for which they are intended; but in England they are at present reducible to two.

The first is called a dry stove, being so contrived, that the flues through which the smoke passes are either carried under the pavement of the floor, or else are erected in the back-part of the house, over each other, and are returned six or eight times the whole length of the stove. In these stoves the plants are placed on shelves of boards laid on a scaffold above each other, for the greater advantage of their standing in sight, and enjoying an equal share of light and air. In these stoves are commonly placed the tender sorts of aloes, cereus's, euphorbiums, tithymals, and other succulent plants, which are impatient of moisture in winter; and therefore require, for the most part, to be kept in a separate stove, and not placed among trees, or herbaceous plants, which prespire freely, and thereby often cause a damp air in the house, which is imbibed by the succulent plants, to their no small prejudice.

These stoves may be regulated by a thermometer, so as not to over-heat them, nor to let the plants, suffer by cold; in order to which all such plants, as require nearly the same degree of heat, should be placed by themselves in a separate house; for, if in the same stove there are plants placed of many different countries, which require as many different heats, by making the house warm enough for some plants; others, by having too much heat, are drawn and spoiled.

The other sorts of stoves are commonly called bark stoves, to distinguish them from the dry stoves already mentioned. These have a large pit, nearly the length of the house, three feet deep, and six or seven feet wide, according to the breadth of the house; which pit is filled with fresh tanners bark, to make an hot-bed; and in this bed the pots of the most tender exotic trees, and herbaceous plants, are plunged: the heat of this bed being moderate, the roots of the plants are always kept in action; and the moisture, detained by the bark, keeps the fibres of their roots in a ductile state, which, in the dry stove, where they are placed on shelves, are subject to dry too fast, to the great injury of the plants. In these stoves, if they are rightly contrived, may be preserved the most tender exotic trees and plants, which, before the use of the bark was introduced, were thought impossible to be kept in England; but, as there is some skill required in the structure of both these stoves, we shall describe them as intelligibly as possible, particularly the bark stove; by which it is hoped every curious person will be capable of directing his workmen in their structure.

The dimension of this stove should be proportioned to the number of plants intended to be preserved, or the particular fancy of the owner; but their length should not exceed forty feet, unless there are two fire-places; and, in that case, it will be proper to make a partition of glass in the middle, and to have two tan-pits, that there may be two different heats for plants from different countries, for the reasons before given in the account of dry stoves; and were I to erect a range of stoves, they should be all built in one, and only divided with glass partitions, at least the half way towards the front; which will be of great advantage to the plants, because they may have the air in each division shifted by sliding the glasses of the partitions, or by opening the glass-door, which should be made between each division, for the more easy passage from one to the other.

This stove should be raised above the level of the ground, in proportion to the dryness of the place; for, if it be built on a moist situation, the whole should be placed upon the top of the ground; so that the brick-work in the front must be raised three feet above the surface, which is the depth of the bark-bed, whereby none of the bark will be in danger of lying in water; but, if the soil be dry, the brick-work in front need not be more than one foot above-ground, and the pit may be sunk two feet below the surface. Upon the top of this brick work, in front, must be laid the plate of timber, into which the wood-work of the frame is to be mortised; and the upper timber in front must be placed four feet asunder, or somewhat more, which is the proportion of the width of the glass-doors or sashes: these should be about six feet and an half, or seven feet long, and placed upright; but from the top of these should be sloping glasses, which should reach within three feet of the back of the stove, where there should be a strong crown-piece of timber placed, in which there should be a groove made for the glasses to slide into. The wall in the back-part of the stove should be at least thirteen inches thick; but eighteen inches is still better; because, the thicker the out-side wall is built, the more the heat of the flues will be kept in the house; and carried up, about nine feet above the surface of the bark-bed; and, from the top of this wall, there should be a sloping roof to the crown-piece where the glasses slide in. This crown-piece should be about sixteen feet high from the surface of the bark-bed or floor, which will give a sufficient declivity to the sloping glasses to carry off the wet, and be of a reasonable height for containing many tall plants. The back-roof may be slated, covered with lead, or tiled, according to the fancy of the owner: for the manner of this outside building is often very various, and differently built.

In the front of the house there should be a walk, about eighteen or twenty inches wide, for the conveniency of walking; next to which the bark pit must be placed, which should be in width proportionable to the breadth of the house: if the house is twelve feet wide, which is a due proportion, the pit may be seven feet wide; and behind the pit should be a walk eighteen inches wide, to pass in order to water the plants, &c. then there will be twenty-two inches left next the back-wall, to erect the flues, which must be all raised above the top of the bark-bed; these flues ought to be one foot wide in the clear, that they may not be too soon stopped with the soot; and the lower flue, into which the smoke first enters from the fire, should be two feet deep in the clear; and this may be covered either with cast iron plates, or broad tiles; over this the second flue must be returned back again, which may be eighteen inches deep, and covered on the top as before; and so, in like manner, the flues may be returned over each other three or four times, that the heat may be spent before the smoke passes off. The thickness of the wall in front of these flues need not be more than four inches; but it must be well jointed with mortar, and plaistered withinside to prevent the smoke from getting into the house; and the out-side should be faced with mortar, and covered with a coarse cloth, to keep the mortar from cracking, as is practised in setting up coppers. If this be carefully done, there will be no danger of the smoke entering the house, which cannot be too carefully avoided; for there is nothing more injurious to plants than smoke, which will cause them to drop their leaves; and, if it continue long in the house, will entirely destroy them.

The fire-place may be made either at one end, or in the middle, according as there is most conveniency; for, wherever it is placed, it should have a shed over it, and not be exposed to the open air; for it will be impossible to make the fire burn equally, where the wind has full ingrefs to it; and it will be troublefome to attend the fire in wet weather, where it is expofed to the rain.

The contrivance of the furnace muft be according to the fuel which is defigned to burn; but, as turf is the beft firing for ftoves, where it can be had, becaufe it burns more moderately, and lafts longer, than any other fort of fuel, and fo requires lefs attendance, I fhall defcribe a proper fort of furnace for that purpofe.

The whole of this furnace fhould be erected within the houfe, which will be a great addition to the heat; and the front wall on the outfide of the fire place, next the fhed, fhould be three bricks thick, the better to prevent the heat from coming out that way. The door of the furnace, at which the fuel is put in, muft be as fmall as conveniently may be to admit of the fuel; and this door fhould be placed near the upper part of the furnace, and made to fhut as clofe as poffible; fo that there may but little of the heat pafs off through it. This furnace fhould be about twenty inches deep, and fixteen inches fquare at bottom; but may be floped off on every fide, fo as to be two feet fquare at the top; and under this furnace fhould be a place for the afhes to fall into, which fhould be about a foot deep, and as wide as the bottom of the furnace: this fhould alfo have an iron door to fhut as clofe as poffible; but juft over the afh-hole, above the bars which fupport the fuel, fhould be a fquare hole about four inches wide, to let in air to make the fire burn: this muft alfo have an iron frame, and a door to fhut clofe when the fire is perfectly lighted, which will make the fuel laft the longer, and the heat will be more moderate.

The top of this furnace fhould be nearly equal to the top of the bark-bed, that the loweft flue may be above the fire; fo that there may be a greater draught for the fmoke; and the furnace fhould be covered with a large iron plate, clofely cemented to the brick-work, to prevent the fmoke from getting out; or it may be arched over with bricks; but you fhould be very careful, wherever the fire is placed, that it be not too near the bark-bed; for the heat of the fire will, by its long continuance, dry the bark, fo that it will lofe its virtue, and be in danger of taking fire; to prevent which, it will be the beft method to continue an hollow between the brick-work of the fire and that of the pit, about eight inches wide; which will effectually prevent any damage arifing from the heat of the fire; and there fhould be no wood-work placed any where near the flues, or the fire-place, becaufe the continual heat of the ftove may in time dry it fo much, as to caufe it to take fire; which ought to be very carefully guarded againft.

The entrance into this ftove fhould be either from a green-houfe, the dry ftove, or elfe through the fhed where the fire is made, becaufe, in cold weather, the front-glaffes muft not be opened.

The other fort of ftove, which is commonly called the dry ftove, as was before faid, may be either built with upright and floping glaffes at the top, in the fame manner, and after the fame model of the bark-ftove; or elfe the front glaffes, which fhould run from the floor to the cieling, may be laid floping, to an angle of forty-five degrees, the better to admit the rays of the fun in fpring and autumn: the latter method has been chiefly followed by moft perfons who have built this fort of ftoves: but, were I to have the contrivance of a ftove of this kind, I would have it built after the model of the bark-ftove, with upright glaffes in front, and floping glaffes over them, becaufe this will more eafily admit the fun at all the different feafons; for, in fummer, when the fun is high, the top glaffes will admit the rays to fhine almoft all over the houfe; and, in winter, when the fun is low, the front glaffes will admit its rays; whereas, when the glaffes are laid to any declivity in one direction, the rays of the fun will not fall directly thereon above a fortnight in autumn, and about the fame time in fpring; and, during the other parts of the year, they will fall obliquely thereon; and, in fummer, when the fun is high, the rays will not reach above five or fix feet from the glaffes.

Befides, the plants placed towards the back-part of the houfe will not thrive in the fummer-feafon for want of air; whereas, when there are floping glaffes at the top, which run within four feet of the back of the houfe; thefe, by being drawn down in hot weather, will let in perpendicular air to all the plants; and, of how much fervice this is to all fort of plants, every one who has had opportunity of obferving the growth of plants in a ftove, will eafily judge: for, when plants are placed under cover of a cieling, they always turn themfelves towards the air and light, and thereby grow crooked; and if, in order to preferve them ftraight, they are turned every week, they will neverthelefs grow weak, and look pale and fickly, like a perfon fhut up in a dungeon; for which reafons, I am fure, whoever has made trial of both forts of ftoves, will readily join with me to recommend the model of the bark-ftove for every purpofe. *Miller's Gard. Dict.*

STOVER, fodder for cattle.

STOUND, a wooden veffel to put fmall beer in.

STOWK, the handle of a pail; alfo a fhock of twelve fheaves.

STOWRE, a round of a ladder; a hedge-ftake; alfo the ftaves in the fides of a waggon, in which the eve-rings are faftened.

STRAIN, or SPRAIN, a violent extenfion of the finews or tendons of fome mufcle, where by the tendinous fibres are overftretched, and fometimes ruptured, or broken.

To form therefore a true idea of thefe diforders, let us firft confider every mufcle, and tendon, as compofed of fpringy elaftic fibres, which have a proper power of their own, to contract and extend themfelves: or, to make their action more familiar, let us compare them to a piece of catgut, that we may the better judge with what propriety oily medicines are directed for their cure. Thus then, if by a violent extenfion of this catgut, you had fo overftretched it, as to deftroy its fpringinefs or elafticity, and was inclined to recover its loft tone; would you for that purpofe think of foaking it in oil? And is not the method of treating ftrains, or overftretched mufcles and tendons, full as prepofterous, when you bathe or foak them in oily medicines, at a time that they want reftringents to brace them up? Yet cuftom has fo eftablifhed this practice, and fallacious experience feemingly fo confirmed it, that it would be a difficult tafk to convince the illiterate, and prejudiced, of the abfurdity; who, by attributing effects to wrong caufes, are led into this error, and the oils ufurp the reputation that is due only to reft and quiet: they feem however to be aware of the ill confequences, by their adding the hot oils, as fpike, turpentine, and origanum; which, though they in fome meafure guard againft the too fuppleing quality of the other oils; yet the treatment is ftill too relaxing to be of real fervice.

And indeed in all violent ftrains of either tendon or mufcles, whatever opinion we may entertain of bathing and anointing with favourite noftrums, which often fucceed in flight cafes, where perhaps bandage alone would have done; yet it is the latter, with proper refting the relaxed fibres, till they have thoroughly recovered their tone, that are the chief things to be depended on; and frequently fome months are neceffary for effecting the cure.

All violent ftrains of the ligaments, which connect the bones together, efpecially thofe of the thigh, require time, and turning out to grafs, to perfect a recovery. External applications can avail but little here, the parts affected laying too deep, and fo furrounded with mufcles, that medicine cannot penetrate to them. The fooner in thefe cafes, a horfe is turned out to grafs, the better, as the gentle motion in the field will prevent the ligaments and joint oil, from thickening, and of courfe the joint itfelf from growing ftiff; nor do I believe that firing, fo commonly practifed in this cafe, is of half the confequence as reft, and turning out for a confiderable time; which by the bye, is always advifed at the fame time the horfe is fired. I could not avoid faying thus much, in order to fhew the great advantages of reft in all ftrains, and that no horfe fhould be worked till he is thoroughly recovered.

When a horfe's fhoulder is overftrained, he does not put out that leg as the other, but to prevent pain, fets the found foot hardly on the ground, to fave the other; even though he be turned fhort on the lame fide, which motion tries him the moft of any. When trotted in hand, inftead of putting his leg forward in a right line, he forms a circle with the lame leg; and when he ftands in the ftable, that leg is advanced before the other.

In order to cure this lamenefs, firft bleed him, and let the whole fhoulder be well bathed three times a day with hot

hot verjuice or vinegar, in which may be diffolved a piece of foap; but if the lamenefs continues without fwelling, or inflammation, after refting two or three days, let the mufcles be well rubbed for a confiderable time, to make them penetrate, with good opodeldoch, or either of the following mixtures:

> Take camphorated fpirits of wine two ounces; oil of turpentine one ounce; this proportion will prevent the hair coming off.
>
> Or,
>
> Take the beft vinegar half a pint; fpirit of vitriol, and camphorated fpirit of wine, of each two ounces.

When the fhoulder is very much fwelled, it fhould be fomented with woollen cloths (large enough to cover the whole) wrung out of hot verjuice and fpirit of wine; or a fomentation prepared with a ftrong decoction of wormwood, bay-leaves, and rofemary, to a quart of which may be added half a pint of fpirit of wine.

A rowel in the point of the fhoulder in this cafe often does great fervice; efpecialty if the ftrain has been very violent, and the fwelling very large; but as to boring up the fhoulder with a hot iron, and afterwards inflating it, is both a cruel and abfurd treatment; and the pegging up the found foot, or fetting on a patten fhoe, to bring the lame fhoulder on a ftretch, is a moft prepofterous practice, and directly calculated to render a horfe incurably lame; for it can only be neceffary in cafes the very oppofite to this, where the mufcles have been long contracted, and we want to ftretch them out.

Where poultices can be applied they are at firft undoubtedly very effectual, after bathing with hot vinegar or verjuice, and are to be preferred greatly to cold charges, which by drying fo foon on the part, keep it ftiff and uneafy; let them be prepared with oatmeal, rye-flower, or bran boiled up in vinegar, ftrong beer, or red wine lees, with lard enough to prevent their growing ftiff; and when by thefe means the inflammation and fwelling is brought down, bathe the part twice a day with either of the above mixtures, opodeldoch, or camphorated fpirits of wine; and rowl the part three or four inches, both above and below, with a ftrong linnen rowler, of about two fingers width; which will contribute not a little to the recovery, by bracing up the relaxed tendon; and perhaps is more to be depended on than the applications themfelves.

As opodeldoch is varioufly made, and thofe ufually fold in the fhops, do not feem fo well calculated for horfes, we fhall infert the following, as better adapted to this purpofe, and recommend it to be kept ready prepared for the ufe of the ftable; it being not only very proper for the above ufe, but for bruifes, cold fwellings, benumbed parts, and for difperfing many other fuch fort of tumors: it may occafionally alfo be given internally for the gripes from wind, or taking cold; for the ftrangury alfo, and as a cordial; one ounce, or more, may be taken for a dofe, in a pint of ale.

> Take Jamaica pepper four ounces, winters bark, carraway feeds, laurel, and juniper berries bruifed, of each two ounces; rofemary, marjoram, and lavender flowers, of each one ounce; rectified fpirit of wine, three pints; let them digeft in a warm place ten days, then ftrain off the tincture, and diffolve in it Venice foap a pound and a half; camphor three ounces; Barbadoes tar four ounces; oil of turpentine fix ounces; oil of amber two ounces; mix and make a liniment.

In Strains of the coffin joint that have not been difcovered in time, there will grow fuch a ftiffnefs in the joint, that the horfe will only touch the ground with his toe; and the joint cannot be played with the hand; the only method here is repeated bliftering, and then firing fuperficially.

Strains of the back finews are very common, and are eafily difcovered by the fwelling, which extends fometimes from the back fide of the knee down to the heel, but for the moft part the horfe fets that leg before the other. The tendon fhould be well bathed three or four times a day with hot vinegar; and if much fwelled, apply the poultices above recommended; and when the fwelling is down, bathe with the mixtures above, or with camphorated fpirit of wine and oil of amber, in which is diffolved as much camphor as the fpirits will take up, and rowl up the tendon with a proper bandage, or laced ftocking; which laft properly fitted to the limb, might be wore to great advantage; not only in thefe fort of injuries, but in moft others, where there is a difpofition to the greafe, or other fwellings of the limbs, from weak and relaxed fibres. Curriers fhavings wetted with vinegar have been found ufeful for this purpofe; as has alfo tar and fpirit of wine: but where the tendon has fuffered by repeated injuries of this kind, the cafe will demand bliftering, firing, and proper reft.

Strains of the knees and pafterns arife frequently from kicks, or blows; if they are much fwelled, apply firft the poultices; and when the fwelling is abated, bathe with the above, or the following.

> Take vinegar one point; camphorated fpirits of wine, four ounces; white vitriol, diffolved in a little water two drams.
>
> Or,
>
> Take the whites of three or four eggs, beat them into a froth with a fpoon; to which add an ounce of roach allum finely powdered; fpirit of turpentine, and wine, of each half an ounce; mix them well together.

The following is alfo much recommended by the French writers, and has been found very fuccefsful in fome old ftrains, when other remedies have failed.

> Take one pound of tar, and two of rectified fpirit of wine, ftir them together over a fire till they incorporate (but take care the flame does not catch the fpirits) then add two ounces of bole finely powdered; and a fufficient quantity of oatmeal to bring it to the confiftence of a poultice; to which add lard enough to prevent its growing dry; apply it fpred on cloth twice a day.

As great weaknefs remains in the pafterns after violent ftrains, the beft method is to turn the horfe out to grafs till he is perfectly recovered; when this cannot be complied with, the general way is to blifter and fire.

When a horfe is lame in the ftifle, he generally treads on his toe, and cannot fet the heel to the ground. Treat him at firft with the vinegar and cooling reftringents; but if a large fwelling with puffynefs enfues, foment it well with the difcutient fomentation till it difperfes; and then bathe the part with any of the above medicines.

A lamenefs in the whirle bone and hip, is difcovered by the horfe's dragging his leg after him, and dropping backward on his heel when he trots. If the mufcles of the hip are only injured, this kind of lamenefs is cured eafily; but when the ligaments of the joint are affected, the cure if often very difficult, tedious, and uncertain. In either cafe, at firft bathe the parts well with the cooling medicines, four or five times a day; in the mufcular ftrain, this method alone may fucceed, but in the ligamentous, it is reft and time only can reftore the injured parts to their proper tone.

Strains in the hock are to be treated by foaking the parts with coolers and repellers; but when the ligaments are hurt, and they are attended with great weaknefs and pain, ufe the fomentation. If a hardnefs fhould remain on the outfide, it may be removed by repeated bliftering; if within, it may be out of the power of any external applications to remove; however the joint fhould be fired gently with fmall razes or lines pretty clofe together, and then covered with a mercurial plaifter. To the difcutient fomentation above mentioned may be added crude fal armoniac, with a handful of wood-afhes boiled in it.

The bliftering ointment for the above purpofes may be found under the article SPAVIN; but the fublimate fhould be omitted.

The firing ufed for the ftrengthening relaxed finews or tendons, fhould act only on the fkin, which by contracting and hardening it all round the finews, compreffes them more firmly like a bandage. *See the article* FIRING. *Bartlet's Farriery, pag.* 224.

STRANGLES,

STRANGLES, a diftemper to which colts and young horfes are very fubject; and begins with a fwelling between the jaw-bones, which fometimes extends to the mufcles of the tongue; and is attended with fo great heat, pain, and inflammation, that fometimes till matter is formed, the horfe fwallows with the utmoft difficulty.

The fymptoms are extraordinary heat and feverifhnefs, with a painful cough, and a great inclination to drink without being able; fome horfes lofing their appetite intirely, others eating but little, by reafon of the pain which chewing and fwallowing occafions: when the fwelling begins on the infide of the jaw-bones, it is much longer in coming to matter than when more to the middle; when it arifes among the glands, and divides into feveral tumours, the cure is generally tedious, as it breaks in different places; and when it forms upwards on the wind-pipe and gullet, there is fometimes danger of fuffocation, unlefs the fwelling foon breaks. But the moft dangerous kind is, when, befides the above fymptoms, the horfe runs at the nofe; this by fome is called the baftard ftrangles.

As this diforder feems to be critical, the moft approved method is to affift nature in bringing the fwellings to maturity, by keeping them conftantly moift with ointment of marfhmallows, and covering the head and neck with a warm hood. But as all fwellings in glandular parts fuppurate flowly, the following poultice may be applied hot twice a day: it is alfo a very proper one to ripen, or bring any other fwelling to matter.

> Take leaves of marfhmallows ten handfuls; white lilly-root half a pound; linfeed and fenugreek feed bruifed, of each four ounces: boil them in two quarts of water till the whole is pulpy, and add four ounces of ointment of marfhmallows, and a fufficient quantity of hogs-lard, to prevent its growing ftiff and dry.

In five or fix days, by thefe means, the matter is generally formed, and makes its way through the fkin; and if the difcharge is made freely and with eafe, the opening need not be inlarged; but fhould be dreffed with the following ointment fpread on tow, ftill continuing the poultice over it to promote the digeftion, and prevent any remaining hardnefs.

> Take rofin and Burgundy pitch, of each a pound and a half; honey and common turpentine, each eight ounces; yellow wax four ounces: hogs-lard one pound; verdigreafe finely powdered one ounce: melt the ingredients together, but do not put in the verdigreafe, till removed from the fire; and it fhould be ftirred in by degrees, till the whole is grown ftiff and cool.

If the fever and inflammation run high, and the fwelling be fo fituated as to endanger fuffocation, a moderate quantity of blood muft be taken away, and the remainder diluted with plenty of water gruel, or warm water, mafhes, &c.

The running at the nofe, which often attends the ftrangles, is dangerous; efpecially if it continues after they have ripened and broke, as the horfe will be greatly weakened thereby. To prevent this wafte and decay, give him every day for fome time an ounce of Jefuits bark; or a ftrong decoction of guaiacum fhavings, which hath been found extreamly beneficial in reftraining thefe glandular difcharges when too liberal, and in drying up ulcers of all kinds in horfes. *See the article* GLANDERS.

If a hardnefs remains after the fores are healed up, they may be anointed with the mercurial ointment; and when the horfe has recovered his ftrength, purging will be neceffary.

STRANGURY, a difeafe incident to cattle, confifting in a difficulty of making urine, attended with great pain. *See the article* KIDNEY.

STRAW, the ftalk on which corn grows, and from which it is thrafhed. *See the articles* DUNG *and* RICK.

STRAWBERRY, the name of a well-known plant, cultivated in gardens for its fruit.

Strawberries may be raifed from feeds; for by that means it is that we have obtained the fcarlet ftrawberry, which is a native of Virginia; the hautboy, originally an American plant; and the Chili ftrawberry, which was firft brought into Europe by M. Frezier, a French engineer: but the common, and moft expeditious way of propagating them is from their runners, which eafily take root at their joints, and there form plants, which, in two or three months, are fit to be cut off and tranfplanted. Thofe which root earlieft in the fpring, and neareft to the mother plant, are the fitteft for this purpofe: and the beft time for removing them is in October, that they may get new roots before the hard froft fets in. They fhould never be taken from old neglected beds, where the plants have been fuffered to run into a multitude of fuckers, nor from any but the moft fruitful plants.

The ground in which they are planted muft be well dug, and very carefully cleared of weeds; and when it is levelled, it fhould be marked out into beds three feet and an half, or at moft four feet wide, leaving a path way of two feet, or two feet and an half broad between them. Thefe paths are neceffary for the convenience of gathering the fruit, for weeding and dreffing of the beds, and, which is of effential confequence to plants that remain fo long in the ground as thefe do, to be frequently dug up, in order to lay fine frefh earth to the roots of the plants. Of the wood ftrawberry, which is a native of this ifland, but of the fmalleft growth of any, though greatly improved, both as to fize and flavour, by culture in the garden, four rows may be planted, in a quincunx order, at about eight inches from each other in the rows, and a foot diftance from row to row, in the beds that are four feet wide: but three rows in a bed three feet wide will do much better, becaufe thefe will be more benefited by the digging of the alleys. The fcarlet ftrawberry muft be planted at a foot diftance every way, and the hautboy at fixteen inches. The Chili ftrawberry, which is the largeft of all, muft be fet at about two feet diftant from plant to plant. This laft is found to fucceed beft under the fhade of trees, in a very ftrong brick earth, approaching nearly to clay: but it feldom perfects its fruit here, fo as to anfwer the trouble of cultivation. In Chili, where it grows wild, the fruit of the larger fort (for there are two kinds, but neither of them fit for the open air in this country) is as big as a wall-nut, but not fo well tafted as our own ftrawberries.

If the winter prove fevere, fome old tanner's bark, or if that cannot be eafily procured, faw-duft, fea coal afhes, or decayed leaves of trees, fhould be fpread over the furface of the bed, between the plants, to keep out the froft. This care is abfolutely neceffary to the Chili ftrawberry, which is frequently killed in hard winters.

In the fpring, after the danger of hard froft is over, the ground between the plants in the beds fhould be forked with a narrow three pronged fork, to loofen it and break the clods: and if the tan, or other covering, which was laid on in the autumn, is then mixed with and buried in the earth, it will be of fervice to the plants, efpecially in ftrong land. A covering of mofs fpread over the beds about the latter end of March, or the beginning of April, will not only keep the ground moift, by preventing the drying winds of the fpring from penetrating it, and thereby contribute greatly to fecure a good crop of fruit; but it will alfo preferve the fruit clean from that grit which is often thrown up by heavy rains after it is full grown, to the great detriment of its flavour, becaufe it muft then be wafhed before it can be eaten. When the plants begin to flower, they muft be watered very plentifully if the feafon is dry, and great care muft be taken to keep them clear from weeds. At Michaelmas, the beds fhould be forked again, the weeding fhould be repeated carefully, the alleys fhould be dug, and the weeds buried in them, all the ftrings or runners muft be taken from the roots, and the plants fhould be thinned, by pulling up the weakeft, wherever they ftand too clofe together. The throwing of a little fine earth over them, at that time, will alfo greatly ftrengthen their roots.

As thefe beds feldom continue good above three years, in the common way of managing them (though Mr. Miller, with greater care and judgment than is ufually exerted, has made them remain in perfection four or five years), and as they yield but little fruit the firft year; it is neceffary to new plant fome frefh ground every third year. When this is done, the old beds may be deftroyed, and the ground converted to fome other ufe, after the new ones

ones have had one year's growth. But that ſtrawberry beds may be made to yield good crops even for ſome years longer than the abovementioned uſual term of their duration, is perhaps more than probable, if they are cultivated according to the principles of what is called the new huſbandry.

The indefatigable M. de Chateauvieux, among his numerous and judicious trials of that huſbandry, upon different plants, applied it to ſtrawberries, of which he planted ſeveral beds of well and deeply looſened earth, ſix feet wide, with ſingle rows. The vigour of the plants, the largeneſs of their leaves, and the very great number of their roots, though cultivated only by ſtirring of the ground with the horſe-hoe, without the leaſt help of dung, manure of any kind, or watering even in the drieſt weather, gave him room to expect, before the firſt ſummer was over, that their fruit would be very large and plentiful the next year: nor was he diſappointed; for in 1754, which was their ſecond year, his ſtrawberries were admirable, extremely large, finely ſcented, and of a very high flavour. He continued the ſame method in 1755 and 1756, and with the ſame ſucceſs as before. In ſhort, though the year 1755 was ſo extremely hot and dry, that no watering could well ſuffice to keep alive the plants that were managed in the common way; theſe remained conſtantly green, and in great vigour, and their fruit was, in every reſpect, finer than that on which the utmoſt care was beſtowed in his kitchen garden.

An ingenious writer in the Muſeum Ruſticum has obliged the world with the following method of cultivating ſtrawberries.

" I have them, ſays he, of ſeveral kinds; and the fruit, in the ſeaſon, is in great perfection, being large, and poſſeſſing a fine flavour. Theſe I procure with no great trouble or difficulty in the cultivation.

" I plant them in regular rows on beds three feet wide. The ſoil I chuſe for them is a good, natural, freſh, rich loam: the leſs it requires of manure the better, the fruit being the ſweeter and finer.

" On each of theſe beds above mentioned, I plant three rows of plants, in quincunx order, at fifteen inches diſtance every way; and I rather chuſe to plant them each on a little hillock, as it were, ſomething in imitation of hops.

" Between the beds are intervals of the ſame width.

" My next care is, by frequent hoeing, to keep my plants as clear from weeds as poſſible, by which they are ſure to be ſupplied with plenty of nouriſhment; a matter of great conſequence, particularly when the fruit is ſet, as then they require moſt, and the weeds are alſo at that ſeaſon moſt luxuriant: I therefore then ſtir the earth with the hoe often, which anſwers, as I ſaid before, a double purpoſe.

" I obſerve to keep my plants as clear as poſſible from runners; by which means my fruit is larger, and ſooner ripe, than it would otherwiſe be.

" When my ſtrawberry plants have borne fruit two ſucceſſive years on the beds, I get the alleys, or intervals, dug up and prepared, into which I tranſplant them in the ſame manner they were planted in the firſt-mentioned beds, which then become in their turn the intervals.

" Here they remain two years more, when I again remove them into freſh land prepared for the purpoſe, in this manner never letting them bear fruit more than two years in one ſpot.

" I cannot eaſily deſcribe to you the great benefit this method of management is of to the plants, which are thereby greatly invigorated, and the fruit prodigiouſly improved, both in point of ſize and flavour, inſomuch that they appear to be quite of a different nature from thoſe of my neighbours, who firſt furniſhed me with the plants."

STRAWBERRY-TREFOIL. *See the article* TREFOIL.

STRICKLE, the whet-ſtone placed upon the extremity of the ſhaft of a ſcythe.

STRIKE, a buſhel, or four pecks of corn.

STRINGHALT, a diſeaſe in horſes, conſiſting in a twitching and ſnatching up of the hinder leg much higher than the other.

STUBBLE, the ſtalks of corn left in the field by the reaper.

It has been a diſpute among farmers, whether wheat-ſtubble ſhould or ſhould not be ploughed in. We ſhall therefore give the following remarks of a ſenſible vale-farmer on this ſubject.

" We are far from being advocates, ſays he, for plowing in ſtubble; yet our land is not light, but the contrary, and bears as good crops of wheat as any in the kingdom.

" As our ſoil is not light, it agrees very well with horſe-beans, which we frequently ſow after wheat; but if ever we let the ſtubble remain uncut till bean-ſeaſon, and plow it in, the conſequences are ſurely fatal; it cauſes the earth to lie hollow; the bean plants to fall down; the ſun and air get at the roots, and prevent the plant thriving; and the crop is always very greatly leſſened: beſides, the ſtubble, which with us is very ſtrong, clogs the plow-ſhare, and gathers up in clods, which are a ſure and a fatal ſhelter for many noxious inſects.

" Theſe facts, which every vale-farmer is well acquainted with, induce us always to mow our ſtubbles, which we apply to many and various uſes: if it is long, it ſerves very well for thatching: we litter our yards, ſtables, and cow-houſes with it for making dung; we uſe it for drying malt; and a great deal is burnt by the poor cottagers, for warming themſelves in winter, dreſſing their victuals, baking, brewing, *&c.*" *Muſeum Ruſticum, vol.* III. *p.* 295.

STUM, the unfermented juice of the grape, after it has been ſeveral times racked off, and ſeparated from its ſediment.

STUMP, the part of any ſolid body, particularly of trees, &c. remaining after the reſt are taken away.

A bare view of Fig. 6. Plate XXIV. is ſufficient to explain a very ſimple engine which Mr. Evelyn gives, for pulling up large roots.

The handle *A* turns the ſpindle of the pinion *B*, which has four or five teeth. Theſe teeth turn the larger wheel *C*, which moves the cylinder D, on which the rope *E* is rolled as the root is drawn up; one end of the rope being previouſly faſtened to the cylinder. The whole frame is let into a block of wood *F*, about four feet high and one in breadth; and the other end of the roller or cylinder is ſuſtained by a leſſer block of wood *G*. *H* is an iron plate which holds the wheel and pinion in the larger block. The cylinder, wheel, pinion, and handle of this machine ſhould be made of good tough iron. The cylinder may be about four inches in diameter, and fourteen or ſixteen inches in length. The reſt is obvious: though I apprehend an improvement might be made, by adding a catch, to ſecure either the handle or the cylinder, while the labourer (for one man will eaſily manage this engine) may be obliged to ſuſpend his work, in order to clear away any obſtacle that may have occurred. It would likewiſe certainty be right to place the wheels, and conſequently the handle, ſomewhat higher than is here directed, to ſave the very great fatigue of ſtooping down continually while this laſt is turned.

Where the roots are very large, and obſtinately tenacious, M. de Turbilly's advice, to blow them up with gunpowder, will be found very beneficial; eſpecially if neither of the abovementioned inſtruments can be had.

Where a place has been over-grown with wood, the earth is ſo thoroughly ſtirred by digging and pulling up the ſtumps and roots of the trees, that one plowing in autumn is generally ſufficient. The froſts in winter kill the weeds and break the clods; and after a ſecond plowing, in the ſpring, theſe lands may be ſown with expectation of an abundant crop: for the trees not having exhauſted the earth towards the ſurface, but having on the contrary manured it with their leaves, a conſiderable produce may be expected for many years.

M. Du Hamel mentions a ſmall field, which had formerly been underwood, and being converted into arable ground, produced plentiful crops of wheat and oats for upwards of twenty years running, without being reſted. It is true the ſoil was peculiarly proper for wheat, and would have been exhauſted much ſooner if it had been a poorer earth.

STUMPY, full of ſtumps; hard, ſtiff.

STURK, a young bullock; a heifer.

STY, a cabbin, or ſmall building to keep hogs in.

SUCCORY. *See the article* ENDIVE.

SUCCULENT, juicy, moiſt.

SUCKER,

SUCKER, a young twig, or shoot from the root.

SUFFOLK-GRASS, the same with meadow-grass, or poa. *See* POA.

SUILLAGE, a drain of filth.

SULL, a plough. *See the article* PLOUGH.

SULL-PADDLE, a plough paddle.

SUMMER, the season in which the sun arrives at the northern solstice, and the days are at the greatest length.

SUMMER, also implies the large piece of timber, or principal beam of a floor.

To SUMMER-LAND, or *To* SUMMER-STIR, to fallow land in the summer.

SUN-FLOWER, the name of a well-known flower, much cultivated in large gardens.

The sun-flower is an annual plant, and the seeds should be sown every spring in a bed of good light earth. When the shoots are about three inches high they should be transplanted into nursery beds, and set at eight inches distance every way; they should remain there till they are a foot high, and then be carefully taken up with a ball of earth at their roots, and planted in large borders, or intermixed with flowering shrubs, and other large plants; they must be frequently watered till they have taken root, after which they require no other care. The flowers appear in July, and stand a considerable time: the largest of them should be preserved for seed. The birds are very fond of the seed of the sun-flower, and must therefore be carefully guarded from them, and the head left on the plant till October, at which time it should be cut off, and hung up to dry in an airy place, and in a month more the seeds will be perfectly hardened. *Miller's Gard. Dict.*

SUN-SCORCHED, a term used in some parts of England to express a distemperature of fruit-trees, owing to the sun's affecting them too forcibly on a sudden; the consequence of which is the loss and withering of the fruit. Such trees only are subject to this, as are planted in places sheltered from the spring sun, and open to that of the summer; and may be always cured by proper waterings.

SURBATING, a term used by farriers to signify the sole of a horse's foot being worn, bruised, or spoiled by beating the hoof against the ground in travelling without shoes, or going in hot sandy lands, or with a shoe that hurts the sole, or the like. It also sometimes happens by over-riding a horse while young, before his feet are sufficiently hardened, or even by the hardness of the ground, and high lifting of his feet. The signs of this defect are his halting on both fore-legs, going stiffly, and creeping as if foundered.

There is nothing better for surbated feet than tar melted into the foot, or vinegar boiled with soot to a proper consistence and poured into the foot boiling hot, with hurds over it, and splints to keep it in.

SURFEIT, a disease incident to horses and other cattle.

Surfeits arise from various causes; but are commonly the effects of some diseases not attended to, or that have been ill cured.

A horse is said to be surfeited, when his coat stares, and looks rusty and dirty, though proper means has not been wanting to keep him clean. The skin is full of scales and dander, that lays thick and mealy among the hair, and is constantly supplied with a fresh succession of the same, for want of due transpiration. Some horses have hurdles of various sizes like peas or tares: some have dry fixed scabs all over their limbs and bodies; others a moisture attended with heat and inflammation; the humours being so sharp, and violently itching, that the horses rub so incessantly, as to make themselves raw. Some have no eruptions at all, but an unwholesome look, and are dull, sluggish, and lazy: some appear only lean and hide-bound: others have flying pains and lameness, resembling a rheumatism: so that in the surfeits of horses, we have almost all the different species of the scurvy, and other chronical distempers.

The following method is usually attended with success in the dry species. First take away about three or four pounds of blood; and then give the following mild purge, which will work as an alterative, and should be repeated once a week, or ten days for some time.

> Take Succotrine aloes six drams, or one ounce; gum guaiacum half an ounce; diaphoretic antimony, and powder of myrrh, of each two drams: make into a ball with syrup of buckthorn.

In the intermediate days, an ounce of the following powder, should be given morning and evening in his feeds.

> Take native cinnabar, or cinnabar of antimony, finely powdered, half a pound; crude antimony, in fine powder, four ounces; gum guaiacum, also in powder, four ounces: make into sixteen doses for eight days.

This medicine must be repeated till the horse coats well, and all the symptoms of surfeit disappear. If the horse is of small value, two or three common purges should be given, and half an ounce of antimony, with the same quantity of sulphur, twice a day, or the alterative balls with camphor and nitre, as directed in the preceding chapter.

If the little scabs on the skin do not peel off, anoint them with the mercurial ointment; during the time of using which, it will be proper to keep the horse dry, and to give him warm water. This ointment properly rubbed into the blood, with the assistance of purging physick, has frequently cured these kind of surfeits, without any other assistance.

The wet surfeit, which is no more than a moist running scurvy, appears on different parts of the body of a horse, attended sometimes with great heat and inflammation; the neck oftentimes swells so in one night's time, that great quantities of a hot briny humour issues forth, which, if not allayed, will be apt to collect on the poll or withers, and produce the poll-evil or fistula. This disease also frequently attacks the limbs, where it proves obstinate, and hard to cure: and in some horses shews itself spring and fall.

In this case bleed plentifully, avoid externally all repellers, and give cooling physic twice a week; as, four ounces of lenitive electuary, with the same quantity of cream of tartar; or the latter, with four ounces of Glauber salts, quickened, if thought proper, with two or three drams of powder of jallap, dissolved in water-gruel, and given in a morning fasting.

After three or four of these purges, two ounces of nitre made into a ball with honey, may be given every morning for a fortnight; and, if attended with success, repeated for a fortnight longer.

The powders above-mentioned may also be given with the horse's corn; or a strong decoction of guaiacum shavings, or logwood may be given alone to the quantity of two quarts a day. These, and indeed all alterative medicines, must be continued for a long time, where the disorder proves obstinate.

The diet should be cool and opening, as scalded bran or barley; and if the horse is hide-bound, an ounce of fenugreek seeds should be given in his feeds for a month or longer; and, as this disorder often proceeds from worms, give the mercurial physic too, and afterwards the cinnabar powders, as above directed; but as in general it is not an original disease, but a symptom only of many, in the cure, regard must be had to the first cause: thus as it is an attendant on surfeits, fevers, worms, &c. the removal of this complaint must be variously effected.

In a mangy horse the skin is generally tawny, thick, and full of wrinkles, especially about the mane; the loins and tail, and the little hair that remains in those parts stands almost always strait out or bristly: the ears are commonly naked and without hair, the eye and eyebrows the same; and when it affects the lymbs, it gives them the same aspect; yet the skin is not raw, nor peels off, as in the hot inflamed surfeit.

Where this distemper is caught by infection, if taken in time it is very easily cured: and I would recommend a sulphur ointment as most effectual for that purpose, rubbed in every day. To purify and cleanse the blood, give antimony and sulphur for some weeks after. There are a great variety of external remedies for this purpose, such as train oil and gun-powder, tobacco steeped in chamber-lye, &c. Solleysell recommends the following.

Take burnt alom and borax in fine powder, of each two ounces; white vitriol and verdigreafe powdered, of each four ounces; put them into a clean pot, with two pounds of honey, ftirring till they are incorporated; when cold, add two ounces of ftrong aqua fortis.

But when this diforder is contracted by low feeding, and poverty of blood, the diet muft be mended, and the horfe properly indulged with hay and corn. The following ointments are effectually ufed for this diforder, rubbed into the parts affected every day.

Take powdered brimftone, train oil, and tar, of each equal quantities; to which may be added ginger, or white hellebore.

Or,

Take fulphur vivum, half a pound, crude fal armoniac one ounce, hogs lard, or oil, a fufficient quantity to form into an ointment.

Or,

Take quickfilver, and oil of vitriol, of each one ounce; hogs lard, one pound, fulphur vivum four ounces, oil of turpentine one ounce and half.

Thefe are both very powerful remedies for this diforder, and can fcarce fail of fuccefs.

To the two firft, occafionally, may be added a third part of mercurial ointment; but as fulphur is in general allowed, to be the fpecific in the itch; and being found both more fafe, and efficacious than mercury; fo we apprehend it will fufficiently anfwer the purpofe here; for as this diforder feems beft accounted for by Leuwenhoek, from certain fmall infects he difcovered in the puftules, by the microfcope; fo it feems as if they were deftroyed, by the fteams of brimftone, though only raifed by the heat of the body; for in the human body, the itch may be cured by partial fulphurous unctions, on the legs only; but where the mange proves obftinate in horfes, let the parts be wafhed with fublimate water before the application of the ointment, and fubjoin the internal ufe of fulphur, in order to diffufe the fteams more certainly through the fkin; there being reafon to believe, as in the itch, that the animalcula may fometimes lie too deep, to be thoroughly deftroyed by external applications only.

SURVEYING, the art or act of meafuring lands; that is, of taking the dimenfions of any field, parcel, or tract of land, laying down the fame in a map or draught, and finding the content or area thereof.

As this art is of the utmoft importance to all owners and occupiers of land, we fhall endeavour to explain it in the eafieft and moft intelligent manner. And in order to this we fhall begin with the principles of the art, and proceed gradually to fhew how all the ordinary figures may be meafured, protracted, and caft up, with no other inftruments than chains, compaffes and fcales. We fhall afterwards endeavour to explain, in a very eafy and concife manner, the ufe of the plain table, and other inftruments ufed in furveying; fo that any perfon, of a common capacity, and that underftands the four firft rules of arithmetic, may be able to furvey and parcel out land, plat it, and give up its content with eafe and expedition.

Of geometrical definitions, divifions, and remarks.

I. A point is that which hath no parts, either of longitude or latitude, but is indivifible, ordinarily expreffed with a fmall prick, like a period at the end of a fentence.

II. A line hath length, but no breadth nor depth, whofe limits or extremities are points. This is either right or crooked.

III. A right line lies ftreight, and equal between its extream points, being the fhorteft extenfion between them; the crooked or circular not fo.

IV. A fuperficies hath length and breadth, but no depth; of this, lines are the limits.

V. A plain fuperficies in that which lieth equally (or evenly) between its lines.

VI. An angle is the meeting of two lines in one point, fo as not to make one ftreight line; and if drawn beyond that point, they will interfect or crofs one another. This in vulgar Englifh may be called a corner; of which there be two forts, one right, the other oblique.

VII. A right angle is that which is made by two right lines, croffing or touching one another perpendicularly, (or fquarely) like an ordinary crofs, or carpenter's fquare.

VIII. An oblique angle is that which is either greater or lefs than a right angle; and this is of two forts, obtufe and acute.

IX. An obtufe angle is greater than a right angle, like the left and right corners of a Roman X.

X. An acute angle is lefs than a right angle, like the higheft and loweft corners of the fame letter.

XI. A figure is that which is comprehended under one line or many; of this there are two kinds, a circle, and a right-lined figure.

XII. A circle is a perfect round figure, fuch as is drawn with a pair of compaffes, the one foot being turned round in a point, and the other wheeled about it. The point in the precife middle is called the center; the round line, the circumference or peripheri; a line going thro' the center, and divides the circle into two equal parts, is called the diameter; half of that line is a femi-diameter, or radius; half the circle is ftiled a femi-circle; the quarter, a quadrant; any portion of it, cut off by a right line not touching the center, is called a fegment.

XIII. Right-lined figures are fuch as are limited by three right lines, or more, and are either triangles or triangulate, that is, fuch as are compounded of, and refolvable into triangles.

XIV. Triangles are figures comprehended under three right lines, and (as Ramus thinks that for a reafon he gives, lib. 6. pr. 6.) might be better called trilaterals; but the name triangle from the number of the angles hath obtained.

Alfo from the nature and quantity of their angles, thefe triangles are diftinguifhed into three forts, 1. Rect-angled, having one right angle. 2. Obtufe-angled, having one obtufe angle. And 3. Acute-angled, having all acute angles; for no triangle can have more right or obtufe angles than one, becaufe by a well known old rule, no triangle upon a plain fuperficies can confift of three greater angles than fuch, as being jointly taken are equal to two right.

Thefe three forts of triangles may, according to the length and proportion of their fides, be fub-diftinguifhed into feven; for each of them may have either two equal fides or none; and the acute-angled may have all three fides or lines equal: but be triangles of what name or kind foever, they are all capable of being exactly meafured by one plain rule, as hereafter fhall fully appear.

XV. Triangulate figures are fuch as have more angles, and confequently more fides or lines, than three; and thefe are either quadrangular or multangular.

XVI. Quadrangular figures are fuch as have four angles, and as many fides, and thefe are either parallellograms or trapefias.

XVII. Parallellograms are figures that are bounded with parallel lines, that is, fuch lines as are every where of the fame diftance one from another, fo as if they were infinitely extended, they would never meet, like the upright lines of the Roman H. Thefe parallellograms are either rectangular or obliquangular.

XVIII. Rect-angular parallellograms are fuch as have four right angles, viz. the fquare or quadrat, and the long fquare, otherwife called the oblong.

XIX. The fquare is that figure that hath four right angles, and four equal fides, like any of the fix faces of a die.

XX. The long fquare hath alfo four right angles, and the oppofite fides are equal, but the adjoining fides meeting at each angle, differ in length. Of this figure is a well printed page in a book, and the fuperficies of a well cut fheet of paper, or an ordinary pane of glafs.

XXI. Obliquangled parallellograms are fuch as have oblique angles, viz. two acute, and two obtufe. Of thefe there are two kinds, the rhombus, and the rhomboides.

XXII. The rhombus is a figure that hath equal fides, but no right angles, like the form of a diamond on the cards, or the moft ordinary cut of glafs in windows, whofe oppofite angles are equal.

XXIII. The rhomboides is a defective rhombus; for if from any fide of a rhombus we cut off a part with a parallel line,

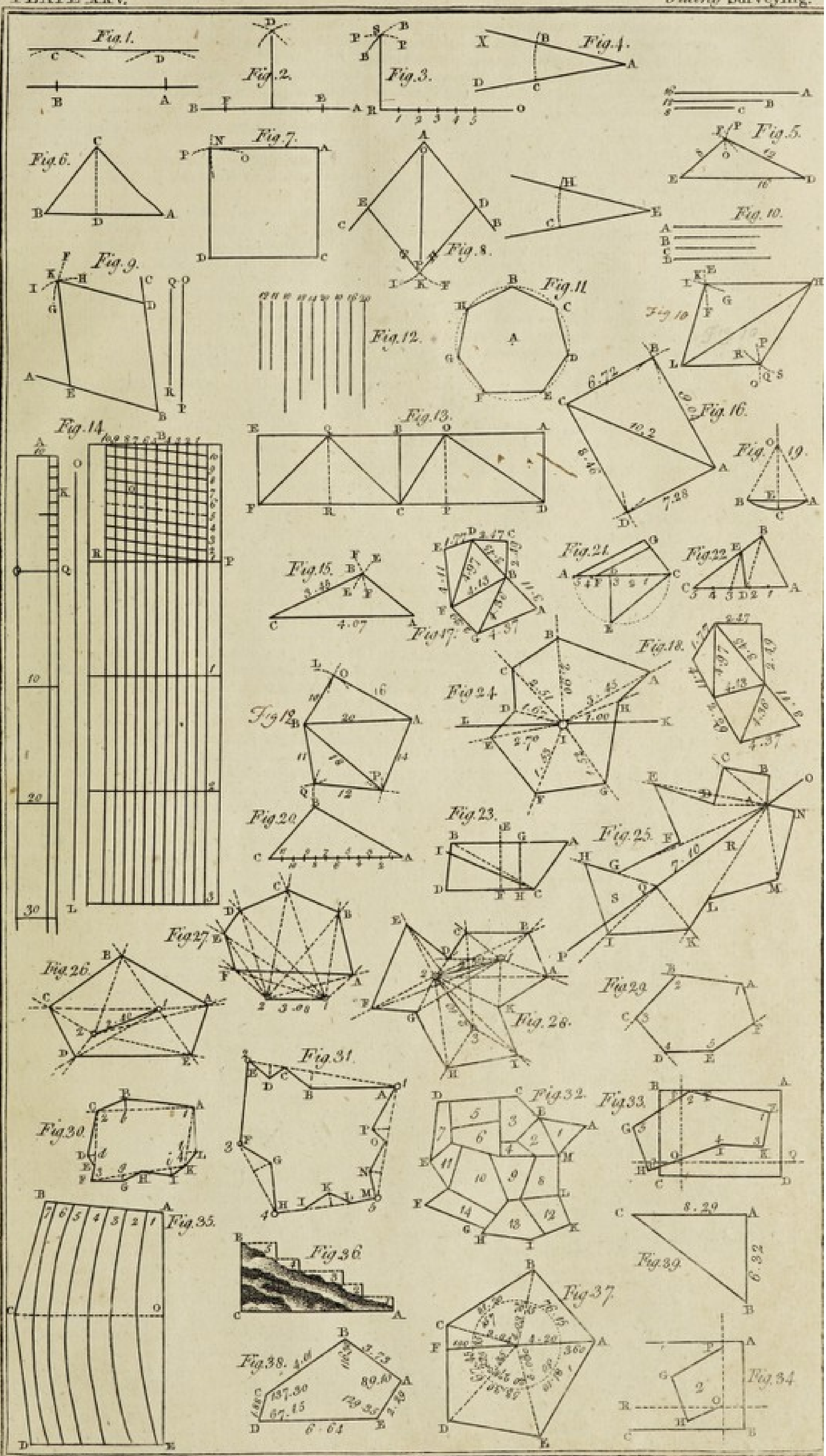
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
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Fig. 6.
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Fig. 33.
Fig. 34.
Fig. 35.
Fig. 36.
Fig. 37.
Fig. 38.

line, the remainder will be a rhomboides, which hath neither equal ſides nor angles, but yet the oppoſite ſides and angles are equal.

XXIV. The trapezium is a figure that is neither parallellogram, nor, conſequently, hath equal ſides or angles, but is irregularly quadrangular, as if drawn at adventure. Of this ſhape moſt fields prove, that ſeem to the eye to be ſquares or oblongs.

XXV. Multangular figures are ſuch as contain more ſides and angles than four, and they are either regular or irregular.

XXVI. Regular multangulars take their names from their number of angles, ſo a pentagon, hexagon, heptagon, octagon, eucagon, decagon, ſignify multangular figures of five, ſix, ſeven, eight, nine, ten angles, and conſequently ſides.

XXVII. An irregular polygon, or multangular figure, is that which hath more angles, and ſides than four, the ſides, and angles, being unequal to one another.

Of geometrical problems.

I. *To draw a line parallel to another, at any diſtance aſſigned.*

Plate XXV. Fig. 1. Open your compaſſes to the diſtance given, and chuſing two points conveniently diſtant in the line given, as here at A and B, deſcribe the arches C and D, to whoſe convexity, if you apply a rule, the parallel line is eaſily drawn.

II. *To raiſe a perpendicular upon a line given, or to croſs that line at right angles in a point aſſigned.*

Fig. 2. Suppoſe the point C in the line A B were aſſigned for the perpendicular, open the compaſſes to a convenient diſtance, and mark out the two points E and F in the line A B, then opening them ſomewhat wider, you may, by ſetting one foot in E and F ſeverally, deſcribe the two arches cutting one another at the point D, from which, if you draw a line to the point C, the work is done for the raiſing of a perpendicular; but if you be to croſs the lines at right angles, you may continue the line from D thro' C at pleaſure.

But if the ſaid line A B had been given to be divided in the preciſe middle, by another line croſſing it at right angles, the way is to ſet one point of the compaſſes in A and B ſeverally, and having deſcribed two arches above the line, interſecting one another as at D, do the like below the line A B from the ſame points, and with the ſame extent of your compaſſes, then through the ſeveral interſections, a rule being laid upon them, a line may be drawn, cutting the given line exactly in the middle at right angles.

Note, That when one point of your compaſſes ſtand in A, you may make both the arches belonging to that center above and below the line; and then removing the compaſſes to B, you may croſs them both.

III. *To raiſe a perpendicular at the end of a line.*

Fig. 3. Let O R be the line given, then to raiſe a perpendicular at R, make five little equal diviſions, and taking four of them with your compaſſes, ſet one foot of your compaſſes in R, and with the other deſcribe the arch P P; then take the diſtance from R to 5, and placing one foot in 3, with the other deſcribe the arch B B, interſecting the former in the point S; then ſhall the line S R (being drawn by a ſtrait rule) be a perpendicular to the line O R.

IV. *To let fall a perpendicular upon a given line from any point aſſigned.*

Open your compaſſes ſo as one foot being ſet in the aſſigned point, the other may go clear over the line given, and thereby deſcribe an arch cutting the line at two points; then ſhall the half diſtance between thoſe two points be the point to which the perpendicular may be drawn from the point aſſigned. But if you think it too much pains to find the point of half diſtance by trial, you may help yourſelf by the ſecond problem: for if you deſcribe two arches interſecting one another on the farther ſide of the line from the aſſigned point, placing (to that purpoſe) the foot of your compaſſes firſt in one of the interſections of the given line, and then in the other; you may by laying a rule upon the aſſigned point, and the interſection of the two arches, draw a perpendicular from the ſaid aſſigned point, cutting the given line at right angles.

N. B. All theſe problems with regard to perpendiculars, aim at no greater matter, than what may be performed in a mechanical way with exactneſs enough by the help of a ſmall ſquare exactly made, for if you apply one leg of ſuch a ſquare to any line, ſo as the angle of the ſquare may touch the end of the ſaid line, or any other point where the perpendicular is to be raiſed, you may by the other leg draw the perpendicular. In the like manner to let fall a perpendicular from a point aſſigned, you need only to apply one leg of the ſquare to the line, ſo as the other may touch, at the ſame time, the aſſigned point, whence you may draw the perpendicular by that leg that toucheth the point.

If the angle of your ſquare be a little blunt, either thro' ill making or long uſing, you muſt allow for it when you apply it to the point in a line. And when you are drawing a perpendicular, you muſt ſtop before you reach the given line, and then by applying the leg of your ſquare to that part of the perpendicular already drawn, ſo as part of that leg may paſs clearly over the given line, you may draw the reſt of your perpendicular as exactly as if the angle had been true. The ſame method is to be taken when a line is to be croſſed by another drawn quite through it at right angles.

V. *An angle being given, to make another equal to it.*

Fig. 4. The angle X A D being given, and a line drawn at pleaſure, as is the loweſt from the point E, open your compaſſes to any convenient diſtance, and ſetting one foot in A, deſcribe the arch B C. Then with the ſame extent ſetting one foot in E, with the other deſcribe the arch C H, long enough to equal or exceed the other. Then taking the diſtance B C between the points of your compaſſes, ſet one in C, and with the other mark the point H in the arch C H, through which point H a line being drawn from the point E, will make an angle with the line E C, equal to the angle given.

Note, When we ſpeak of the quantity of angles, their equality or unequality, we never regard the length of the lines; for if you extend or contract them at pleaſure, the angle is ſtill the ſame. But that is the greateſt angle whoſe lines are fartheſt diſtant from one another at the ſame diſtance from the angular point, or the place where its lines meet.

VI. *Any three lines being given, (equal or unequal) ſo as no one of them be longer than the other two joined together, to make a triangle of them.*

Fig. 5. The lines A B C being given, ſet the line A from D to E; then with your compaſſes take the length of the line B, and ſetting one foot in D, deſcribe the arch P O. This being done, take with your compaſſes the length of the line C, and ſetting one foot in E, with the other croſs the former arch at F, from which interſection drawing lines by a rule to D and E, the triangle is finiſhed.

Note, That if all the ſides, or two of them, be equal, the method is the ſame; but the labour leſs, becauſe we need not to take the ſame length twice over with the compaſſes.

VII. *To find the perpendicular of the triangle, in order to the meaſuring of it.*

Fig. 6. Let the line A B be accounted the baſe, and from the angle C, let fall a perpendicular as was taught Probl. 4. upon that line at D, which is ready for taking off with compaſſes, and meaſuring on a ſcale, of which hereafter in meaſuring the content of figures.

But if we have no occaſion to draw the perpendicular, but only to know the length of it, (as it moſt frequently falls out in meaſuring) no more is needful, but to ſet one foot of the compaſſes in the angular point C, and extend the other to the baſe A B, ſo as it may touch it, but not go beyond it; then have we the perpendicular between the points of the compaſſes.

VIII. *One ſide being given, to make a ſquare.*

Fig. 7. The line C D being given, raiſe a perpendicular at C of the length, at the leaſt, of the given line; then taking the line C D between the feet of your compaſſes, ſet it upon the perpendicular from the angular point C to A: with the ſame diſtance ſetting one foot in D, deſcribe the arch O P. Laſtly, with the ſame diſtance, or extent, ſet one foot in A, and with the other deſcribe the arch,

 croſſing

croffing the arch O P in N, from which interfection a line drawn by a rule to A, and another to D, finifh the geometrical fquare or quadrant A C D N.

IX. *To make a long fquare, the length and breadth being given.*

This is fo nearly like the former, that a particular figure is not neceffary to explain it. Suppofe each fide of the fquare in the laft problem to confift of 8 fmall equal parts, and you were to make a long fquare, whofe length muft be equal to a fide thereof, viz. 8, and the breadth half fo much: when you had drawn the line C D, for the length, and raifed the perpendicular at C, you muft take the fhorter line given for the breadth, and fet upon the perpendicular from C, upwards to a point, which for diftinction we fhall call the point E, imagining it fo marked: with the fame extent of the compaffes defcribe the arch, placing one foot in D. Laftly, extending your compaffes to the length of the line C D, fet one foot in E, and with the other crofs the arch aforefaid. Then a right line drawn from that interfection to E, and another from the fame to D, compleat the long fquare.

X. *To make a rhombus, the fides being given.*

Fig. 8. If the angles be not limited, draw any oblique angle at pleafure, either acute or obtufe, as here the angle B A C, which is acute. Then let the line O P be the length of a fide, which being taken with your compaffes, fet it from the angular point A, in both lines to D and E, in which two points, place a foot of your compaffes fucceffively without altering them, viz. in D, to defcribe the arch F G, and in E to defcribe the arch H I, croffing one another in the point K, from which, right lines drawn to D and E, finifh the rhombus D A E K.

Note, If any angle be given together with the fide, to limit the fhape and content, begin with that, and proceed as before; for you muft know, that to make a rhombus (or rhomboides) like to another for figure, or equal to it in content, it is not fufficient to have the fame fides; for the more oblique the angles are, the farther will the rhombus differ from a fquare, and the lefs will be the content. But you muft have an angle given, or elfe a diagonal line, which is a right line paffing through the rhombus from one oppofite angle to another, and dividing the figure into two equal triangles. If the former, viz. an angle, be given, we have fhewed what ufe is to be made of it. If the latter, *i. e.* a diagonal, together with the length of the fides, you may, by taking the length of the fides with your compaffes, and fetting a foot in the ends of the diagonal line, make a triangle on the one fide of the diagonal, by Probl. 6. and then another on the other fide by the fame problem, the diagonal being a common bafe to them both; and this will give the figure exactly.

XI. *To make a rhomboides, the fides being given.*

Fig. 9. If neither angle nor diagonal be given, make any angle at adventure, as here A B C. Then fuppofing the lines given to be O P and Q R, fet the length of the longer upon the line B C, from B to D, and the fhorter on the line B A to E. Then with the compaffes extended from B to E, fet one foot in D, and defcribe the arch F G. Likewife, with the compaffes extended to the length of the line O P, fetting one foot in E, with the other defcribe the arch H I, interfecting the former arch at K; from which interfection lines drawn to D and E, finifh the rhomboides.

XII. *To make a trapezium, the diagonal and lines in order being given.*

Fig. 10. Let the line HL be the diagonal of a trapezium, whofe fides are the lines A B C D; the fide A being counted the firft, as that which takes it, being from the point H, and the reft in the order as they are marked alphabetically.

Then with your compaffes fet to the length of the line A, place one foot in H, and with the other defcribe the arch E F. Next taking the length of the line B, with the one foot of your compaffes placed in L, with the other make the arch G I, interfecting the former at K; from which point of interfection, lines drawn to H and L, make the triangle H K L.

Then with the extent of the line C, fet one of the feet of your compaffes at L, and defcribe the arch O P. Laftly, fetting them to the length of the line D, and placing one foot of your compaffes in H, with the other make the arch S R, interfecting the former at Q; fo fhall lines drawn from Q, to L and H, make up the triangle L Q H, and finifh the trapezium H K L Q.

I could have been much briefer in this problem, by referring to the 6th; but this being of very great and frequent ufe, I defired to be very plain.

XIII. *To make a regular polygon, otherwife called a regular multangular, or multilateral figure, confifting of many equal fides and angles, viz. above four apiece.*

Being fatisfied what fhall be the diftance between the center and every angle, with that diftance defcribe a circle, which being equally divided into as many parts as the figure muft have angles (or fides, for they are equal in number) and lines drawn from the points of divifion within the circle from point to point, (ordinarily called chords) the polygon is finifhed, as in this diagram.

Fig. 11. Suppofe an heptagon, or multangular figure of feven fides, and as many angles, be to be defcribed, every angle being defigned to be diftant from the center A, feven eighths, or three quarters and a half of an inch; with that diftance defcribe the circle B C D E F G H, which being divided into feven equal parts, and lines drawn from point to point, the heptagon B C D E F G H will be therein included.

We fhall rather leave our reader to find out the points of divifion by many trials, than to puzzle him with the geometrical way for finding out chords to that purpofe.

XIV. *Having the fides of the triangles whereof it confifteth, orderly given, to make an irregular multangular, or multilateral figure.*

This will be more fully handled hereafter, when I come to fhew the method of drawing plats of ground. In the interim I will give you a fpecimen of an irregular pentagon.

Fig. 12. Having the lines of three triangles given, lay down the greateft of the firft, viz. 20, from A to B for a bafe, and by Probl. 6, make a triangle of it, and the other lines 16 and 10, viz. the triangle A B O.

Secondly, You find by the number 20 over the firft line of the fecond triangle, that it is the common bafe to them both; and therefore, by the fame Probl. 6, make the triangle A B P of the lines 20, 14, 18.

Laftly, Finding the bafe of the third triangle to be the fame with 18, one of the fides of the fecond make the triangle P B Q of the lines 18, 11, 12: fo is the quinquangular figure finifhed.

How every line is to be found in its due order in this, or any other fort of multangular figures, fo as to give a true and exact account, not only of the fuperficial content, but alfo of the figure and fituation, is to be taught hereafter in the doctrine and practice of Protraction.

How to find the fuperficial content of any right-lined figure, the lines being given.

As a foundation to what we fhall lay upon this fubject, there are fome few geometrical principles or theorems out of Euclid and Ramus, which I defire may be remembered; and becaufe underftanding is a great help to memory, we fhall make ufe of a kind of ocular demonftration; which, though not fo ftrict and artificial as that which is to be found in the commentators upon Euclid in the quoted places, will be more ferviceable becaufe more eafily underftood.

Theor. 1. *Every parallelogram being of the fame length with the bafe of a triangle, and of the fame height with the perpendicular of that triangle, is double to it.* Euclid 41. 1.

Fig. 13. Here are two equal oblongs, or long fquares, A B C D and B E F C, and within them two triangles infcribed, whofe bafes are of the fame length, and their perpendiculars, O P and Q R, of the fame height with the oblongs. Now each of thefe triangles being parted into two right-angled triangles by their perpendiculars, then it is plain to the eye, and from the nature of diagonals, which ever divide a parallelogram into equal parts, that the two new

new triangles O P D and OPC, which make up the first of the given triangles, are equal to the triangles D A O and O B C, which make up the remainder of the parallellogram A B C D. Therefore that parallellogram is double to that triangle, which was to be demonstrated.

In like manner it is evident, that the parallellogram B E F C is double to the triangle C O F, because C R Q is equal to B Q C, and Q R F is equal to Q E F.

Theor. 2. *All triangles having the same base, and lying between the same parallels, are equal.* Euclid 37. 1.

So in our last diagram, the two given triangles having bases of the same length, and lying between the same parallels, are evidently equal, because they are demonstrated to contain each of them the exact half of the parallellograms, wherein they are inscribed; and the parallellograms being equal, their halves must be equal also.

Theor. 3. *The sides of the triangulate (that is, one that hath four or more sides) are ever two more than the triangles of which it is made.* Ram. lib. 10. prop. 2.

Fig. 10, 12. This is plain by inspection, if you view again the figures of the trapezium and irregular pentagon, in the 12th and 14th problems.

These theorems being allowed to be true the doctrine concerning the superficial content of right-lined figures, might be reduced to a narrow compass; for he that knoweth how to husband these three theorems, may easily take up these corollaries, *ordine inverso*.

1. Any quadrangular figure, regular or irregular, may by a diagonal be parted into two triangles; any five-sided figure by two diagonals into three triangles; and six-sided figures into four by three diagonals, &c. by Theor. 3.

2. It is no matter of what shape the triangle is, as to the rule for measuring, for whether it be right-angled, acute-angled, or obtuse-angled, and whether it have three, two, or no lines equal, it is only the length of the base, and height of the perpendicular, and is considerable by Theor. 2.

3. The true measure or content of any triangle, whether alone, or as part of any triangulate figure of 4, 5, 6, or more sides, (and consequently of the whole figure, by summing up the content of all the several triangles) is found by multiplying the whole base of the triangle by half the perpendicular, or the whole perpendicular by half the base; which being a rule of such infinite use in surveying, we desire it may be remembered; and that it may be understood, we shall give a plain example.

Fig. 6. Suppose A B the base of the triangle belonging to the 7th problem, to be 44, and the perpendicular C D to be 20: whether you multiply 44, the whole base by 10, the half of the perpendicular, or 20, the whole perpendicular by 22, the half base, the product gives the content 440, as is here apparent.

44	20
10	22
440	40
	40
	440

Having thus given a general method how all right-lined figures may be reduced to triangles, and so their content found, we might pass to the next head concerning instruments, and their use; but because there are nearer ways in measuring particular kinds of triangulate figures proper to those kinds, we shall briefly mention them.

I. *To find the contents of a square, or long square.*

Multiply the length by the breadth, the product gives the area or content.

Example of a square.

17 inches length.
17 inches breadth.

119
17

289 square inches.

Example of an oblong.

25 feet long.
13 feet broad.

75
25

325 square feet.

II. *To find the area or content in measure of a rhombus.*

Let fall a perpendicular from one of the obtuse angles upon the opposite side; that side multiplied by the perpendicular, gives the area.

20 yards the side.
14 yards the perpendicular.

80
20

280 square yards.

III. *To find the area of a rhomboides.*

Divide it into two triangles by a diagonal drawn between either pair of the opposite angles, then from either of the other angles let fall a perpendicular upon that diagonal; then shall that diagonal, being multiplied by that perpendicular, give the area.

Example.

19 rods the diagonal.
5 rods the perpendicular.

95 square rods the content.

IV. *To find the content of a trapezium.*

Fig. 10. Divide it by a diagonal into two parts from angle to angle, as the trapezium, probl. 12. is divided by the diagonal H L, then from the other two angles, which in that figure are marked with K and Q, let fall perpendiculars upon the diagonal, half the sum of those perpendiculars being multiplied by the diagonal, or common base, gives the superficial content.

Example.

Suppose in the trapezium before mentioned the diagonal is 33, the perpendicular from K 13, and that from Q 15, the area or superficial content is thus computed.

13 chains the first perpendicular.
15 the second perpendicular.

28 the sum of both perpendiculars.

14 their half sum.
33 the diagonal.

42
42

462 square chains the area.

V. *To find the content of a regular polygonial, or multangular figure, otherwise called multilateral.*

Draw a line from the center to the middle of any side; half of the perimeter, or of all the sides, being multiplied by that line before-mentioned, gives the content.

VI. *To find the content of an irregular polygon, or many-sided figure.*

Divide it into trapezias and triangles by diagonal, then find their content severally, and sum up all together.

Fig. 12. Suppose the polygon belonging to the last problem were given without the diagonals A B and B P; then by drawing those diagonals, the figure is divided into three triangles, whereof two being upon the same base A B, make up a trapezium, whose content may be found just in the same manner as was taught even now in the fourth rule, having found the perpendiculars from O and P falling upon the line A B. Then there remains the triangle B Q P, whose content may be found by the general rule concerning triangles, having found the perpendicular falling from Q on the line B P; and then having added the content of that triangle to the content of trapezium, you have the area of the whole polygonial figure.

Concerning chains, compasses, and scales.

I. Amongst the many sorts of chains used for measuring land, three are most famous, bearing the names of their inventors, Mr. Rathborne, Mr. Gunter, and Mr. Wing, all of them ingeniously divided, and useful in their kind;

kind; but brevity will give us leave only to deſcribe one, and that ſhall be Mr. Gunter's, being moſt in uſe, and eaſy to be procured.

This chain contains in length, four ſtatute-poles or perches, each perch containing 16 feet and a half, or 5 yards and a half; ſo that the whole chain is 66 feet, or 22 yards long.

This whole chain is divided into 100 equal parts or links, whereof 25 are a juſt pole or perch; and for ready counting, there is uſually a remarkable diſtinction by ſome plate or large ring at the end of every 25 links, but eſpecially at the preciſe middle of the chain, which ſhould differ from the reſt in greatneſs and conſpicuouſneſs. Alſo at the end of every tenth link, it is uſual to hang a ſmall curtain-ring; and if there be at every five links end a piece of wire made like the bow of a link, with a little ſhank an inch or leſs long, or ſome ſuch diſtinction, it is ſtill better.

When you are to meaſure any line by this chain, you need to regard no other denomination but only chains and links, ſet down with a prick of your pen betwixt them. *e. g.* If you found the ſide of a cloſe to be 6 chains and 35 links long, it is thus to be put down, 6. 35.

But if the links be under 10, a cypher muſt be prefixed; ſo 7 chains 9 links muſt be thus ſet, 7.09.

In the uſing of this, or indeed of any, chain, care muſt be taken both to go ſtrait, and to keep a true account; for which purpoſe, it is good that he which goeth before, carry in his hand a bundle of rods, to ſtick down one at the end of the chain which leads, having firſt ſtretched it well, and that he which follows do not only gather up the rods to keep the account, but alſo at every remove, mark whether he ſee the leader directly between his eye and the angle, or other mark he aims to meaſure to; and if need be, call to the leader to move towards the right or left hand, till he ſee him in a direct line to it.

II. Compaſſes are ſo well known, that we need not deſcribe them; only they ſhould be of braſs, with ſteel points, ſmall and neatly wrought, nine or ten inches long from the joint to the points, turning ſo truly upon the rivet, that they may be eaſily opened, and yet ſtand ſo firmly, that an arch or circle may be, without their ſhrinking, deſcribed upon a large radius.

III. Scales are certain lines divided into equal parts, upon plates or broad rules of braſs or box, and they are of two ſorts, 1. Plain. 2. Diagonal.

1. Plain ſcales are made up of two ſmall lines parallel to one another at a little diſtance, and theſe are divided into great equal parts, which ſignify tens, and are noted 10, 20, 30, 40, 50, &c. according to the length of the lines.

They may be of any convenient length, but theſe great diviſions are ſeldom more than inches, or leſs than third parts apiece.

Again, one of the great diviſions is ſub-divided into ten equal parts by ſhort lines, whereof that in the middle ſtanding for 5, is longer than the reſt.

Fig. 13. According to the numbers of theſe little parts contained in an inch, the ſcale is named, A ſcale of 10, 11, 12, 16, 20, 24, 30, &c. in an inch. That ſhort one which we give you the figure of A, is of 10 in an inch, ſo noted at the top, according as is uſual upon the rules, and indices of plain tables. The line marked O Q, ſeparates units and tens; units being taken upward from that line, and tens downward; mixt numbers both ways.

As for example.

7 is the extent of the compaſſes upon the ſcale A, from the line O Q to K; 30 is their extent from the line ſo marked to O Q; and 27 is their extent from the line 20, to the ſhort line K aforeſaid.

Here note, that you muſt not expect to find the letters O Q or K upon the ſcales which you buy, being only marks uſed at pleaſure, to make my meaning plain; and likewiſe that this ſcale of 10 in an inch, and others that are ſmaller are uſually made, for more convenient uſe, ſo long as to contain nine or ten of the great diviſions, ſignifying tens; though the figure at A being deſigned for no other uſe than to help our conceptions, extends but a little beyond 30, that length being ſufficient for my purpoſe in this place.

Fig. 14. Theſe plain ſcales, eſpecially the ſmaller ſorts of them, ſuch as 24 or 30 in an inch, are very proper for drawing figures upon paper, where the numbers repreſented by the lines are not above 100, for then every diviſion may be counted as it is upon the ſcale, or above upon a long ſcale.

Alſo in the ſurveying of foreſts, chaſes, and great commons, where the lines are vaſtly long, and the miſtake of a few lines is not conſiderable, they may be conveniently uſed, accounting the tens and units to ſignify ſo many whole chains, and ſo eſtimating the parts of a chain with the compaſſes upon the ſmall diviſions, which a ſagacious man may do very near upon one of the larger ſcales. But it would be much better for ordinary meaſuring, if the grand diviſions of the ſcale were two inches apiece, for then the ſmaller diviſions being of five in an inch, would be ſo large as to be ſub-divided into five apiece, which repreſents 20 links; and then the half one of thoſe ſmaller diviſions ſignifying 10 links, and the quarter 5, a very ordinary judgment may come very near to the truth by eſtimation.

2. But the diagonal ſcale is ſo well known to every mathematical-inſtrument-maker, ſo eaſy to be procured, and every way ſo fitted to Gunter's chain, that we cannot but highly commend it.

It is made, as appears by the figure B, upon eleven parallel lines equidiſtant, ſo as to include ten equal ſpaces, which are all cut at right angles by tranſverſe lines dividing them all into four equal parts.

One of theſe tranſverſe lines, *viz.* P R, where it toucheth the firſt and laſt lines, ſeparates between the hundreds, or whole chains, and the tens, repreſenting 10 links apiece, the chains being numbered downwards on the left hand from P only to 3, but on the inſtrument itſelf they may go on to 9 or 10, but the tens upward from P to 10.

From the points of diviſion into tens upon the firſt line, beginning at P, to the like points beginning at R in the laſt line are nine diagonal lines drawn, the firſt beginning at P, and ending at the firſt diviſion above R. The ſecond begining at the firſt diviſion above P, and ending at the ſecond above R. In a word, they are all drawn from one diviſion leſs from P, to one more from R; by which it comes to paſs that every diagonal, by that time it hath paſſed from the firſt line to the eleventh, is a whole tenth part of an inch, which anſwers to ten links of the chain, farther diſtant from the line P R than at the points upon the firſt line whence it was drawn.

Every one of thoſe diagonals is divided into ten equal parts by the long parallel lines running through the whole ſcale, and numbered on the top from 1 to 9. Whereby it is evident that the interſection of any of the nine parallel lines that are numbered at the head with any diagonal, muſt be farther diſtant from the line P R, than the interſection of the line next before it with the ſame diagonal by $\frac{1}{10}$ of $\frac{1}{10}$, that is, by $\frac{1}{100}$, which anſwereth to a ſingle link of your chain.

From what hath been ſaid, and inſpection of the figure B, theſe things plainly follow; which, as ſo many clear inſtances, will help you to underſtand it fully.

The diſtance from P R, to the ſecond diviſion below it, anſwereth to two chains.

The diſtance from P R to the eighth diviſion upward, being taken (with compaſſes) upon the firſt line of the eleven from P to 8, anſwereth to 80 links.

Conſequently the extent of the compaſſes from the ſecond grand diviſion below P, to the eighth of the leſs diviſions upward, is proportionable to 2 chains 80 links.

The diſtance from P R to the firſt diagonal being taken upon the parallel line, noted with 9 above, anſwereth to 9 links: where note, that the firſt diagonal is not that which is noted with 1, but that which is drawn from the point P.

The diſtance upon the ſame line from P R to the diagonal that is marked with 7, is anſwerable to 79 links.

The extent of the compaſſes from the bottom of the figure upon the ſame line to the ſame diagonal, anſwereth to 3 chains 79 links.

In ſhort whole chains may be meaſured upon any line from P R, to the grand diviſion noted with the given number, decads alone, or chains and decads upon the firſt line of the eleven where the diagonals begin. Links alone, decads with links, and chains and decads with links, always upon that line upon which the number of the odd links ſtands at the head of the ſcale.

N. B. Theſe directions will as well fit, if half an inch be only allowed for a chain, and conſequently all the diagonals, genals drawn within that extent, as it is usual upon the other end of the same rule, the grand division for chains going the contrary way, and noted with numeral figures in order. It is therefore proper when you furnish yourself with scales, to have diagonal scales of both dimensions on the fore-side of your rule, and upon the back-side many plain scales of equal parts, with a line of chords.

How to cast up the content of a figure, the lines being given in chains and links.

Having described these plain instruments, and in some measure shewed the use of them in severals, it were very proper in the next place to teach their joint use in measuring and protracting; but because we would have our young surveyor, before we take him into the field, able to perform his whole work together, we intend to shew him, 1. How he ought to make his computations; 2. The grounds or principles that will justify him in so doing.

For the first, take these rules:

1. Put down your length and breadth of squares and oblongs, and your base and half perpendicular of triangles directly under one another, expressed by chains and links with a prick betwixt them, as was taught before, chap. 4.

2. If the odd links were under ten, put a cypher before the numeral figure expressing them, (as there also was shewed) and if there be no odd links, but all even chains, put two cyphers after the prick.

3. Multiply length by breadth, and base by the half perpendicular, according to the rules for finding the content of figures, chap. 3.

4. From their product cut off five figures, accounting cyphers also for such, reckoned from the right hand backward, with a dash of your pen, so shall those to the left hand signify acres.

5. If those five cut off were not all cyphers, multiply them by four, and cutting off five towards the right hand again, the rest will be roods or quarters.

6. If amongst these five figures towards the right hand that were cut off at the second multiplication, there be any figures besides cyphers, multiply all the five by forty, and cutting off five again by a dash of your pen, those on the left hand signify square perches, poles, or roods.

A few examples will make all plain.

Quest. 1. *What is the content of a square, whose sides are every one of them 7 chains, 25 links?*

```
Length  7. 25.
Breadth 7. 25.
        ------
          3625
         1450
        5075
        ------
       5|25625
             4
        ------
       1|02500
            40
        ------
       1|00000
```

Answ. 5 acres, 1 rood, and 1 perch, as here appears.

Quest. 2. *In a long square whose length is 14 chains, and the breadth 6 chains 5 links, what is contained?*

```
Length  14.00
Breadth  6.05
        ------
          7000
         84000
        ------
       8|47000
             4
        ------
       1|88000
            40
        ------
      35|20000
```

Answ. 8 acres, 1 rood, and 35 perches, as the work makes it evident.

Quest. 3. *In a triangle, whose base is 3 chains, and half the perpendicular 98 links, what is the content?*

```
The base        3.00
Half perpend.   0.98
               ------
                2400
                2700
               ------
               |29400
                    4
               ------
              1|17600
                   40
               ------
              7|04000
```

Answ. 0 acres, 1 rood, 7 perches.

There are other ways of computation by scales, tables, &c. But that this is demonstrative, will appear by the following steps.

1. It is evident, that in this way of multiplication, the product is square links; for every chain being 100 links, it is all one to multiply 7.25 by 7.25, or 725 by 725 without pricks; for the pricks signify something as to conceptions, but nothing at all in operation. The product therefore of the first example was really 525625 links.

2. Every chain being 4 perches long, it follows, that 5 chains, or 20 perches, in length, and 2 chains, or 8 perches, in breadth, make an acre, or 160 square perches; for 20 being multiplied by 8, gives 160.

3. From hence it plainly follows that there are exactly 100000 square links in an acre; for 5 chains multiplied by 2, is the same with 500 links by 200, which makes 100000. And he does not deserve the name of an arithmetician, that is ignorant of this old plain rule, when the divisor consists of 1 and cyphers, as 10, 100, 1000, 10000, 100000, &c. cut off from the right hand so many figures of the dividend as the divisor hath cyphers, accounting them the remainder; so shall the rest on the left side be the quotient. It is plain then that 525625 square links, make 5 acres, and 25625 square links over.

Thus we have made it clear to a very ordinary capacity, that as far as concern acres, the rules for computation are good. Now for roods and perches, though it might be sufficient to mention that known rule in decimal arithmetick, multiplying decimal fractions by known parts, gives those known parts in integers, due regard being had to the separation, we shall proceed thus: if 25625 square links, which remain above an acre, contain any quarter or quarters of an acre, then, if they be multiplied by 4, and divided by 100000, that is, five cut off from the product, they will contain so many acres as now they do quarters, or roods, for any number of quarters multiplied by 4, must needs produce the like number of unites or integers, and the division only reduce them into the right denomination. Now, 25625 being multiplied by 4, and five figures being cut off from the product, the result is, 1|02500, that is, an acre and above; which shews it was above a quarter before it was multiplied by 4.

And to find how much, that is, how many square perches are contained in this last remainder, you must consider this 2500, not as square links remaining above the rood or quarter, but as four parts or quarters of square links, or, which is all one, as the true number of square links multiplied by 4, and consequently being multiplied by 40, the fourth part of square perches in an acre, it must as often contain 100000 square links, or an acre, as the quarter of this number 2500, viz. 625, signifying square links, containing square perches; and so, for 100000 divided by 160, the number of perches in an acre, gives 625, answering to one perch; and 2500 multiplied by 40, gives 100000, or one acre, the five cyphers being cut off.

```
  2500        160      100 000625
    40                     960
 -------                  -----
 1|00000                   400
 -------                   320
                          -----
                           800
                           800
                          -----
```

How to meaſure a cloſe, or parcel of land, and to protract it, and give up the content.

Hitherto we have been like children learning to ſpell, now let us ſet our ſyllables together: that is, let us make uſe of the inſtructions before given to meaſure a piece of land, to plot it, and to caſt up the content.

All cloſes, or parcels of land, are either ſuch as need not be plotted for finding their true meaſure, but the chain alone doth the work; or ſuch as cannot be conveniently meaſured without plotting or protraction.

Of the firſt ſort are the ſquare and long ſquare, known before-hand to be ſuch, or found ſo to be by ſuch inſtruments as are not yet deſcribed, or by meaſuring all the ſides and diagonals. Theſe ſquares and long ſquares, need no protracting; for you need only to multiply the chains and links of the length, by the chains and links of the breadth, and ſo proceed as in the firſt and ſecond examples: but all others, whether triangles or triangulate, are to be protracted. We ſhall give examples therefore in the three ſorts of figures, triangular, quadrangular, and multangular.

But before we proceed to particular inſtances, let the young practitioner remember,

1. To begin at ſome notable angle of the field where there is ſome houſe, gate, ſtile, well, or the like; or if there be none, then to dig up a clod, drive down a ſtake, or at leaſt, to obſerve what quarter of the heavens it pointeth towards, whether eaſt, weſt, north, or ſouth, and on your paper mark it with the letter A, or any other.

2. To go parallel to the ſide of the field, if pits, buſhes, or the like, hinder not, and if they do, to allow for it, accuſtoming yourſelf to go either with your left hand towards the hedges, walls, or pales; or with your right hand towards them; and when you go contrary to your uſual cuſtom, note it on your paper by ſome mark known to yourſelf.

3. To ſet down the chains and links of every ſide as you meaſure them, and not truſt your memory. A black lead pen will be very proper for this purpoſe.

4. To take care, if you have more ſcales than one upon your rule, leſt you confound yourſelf by taking lines off of ſeveral ſcales, or meaſuring perpendiculars upon wrong ones; for every line of the ſame figure muſt be made by the ſame ſcale, and the perpendiculars meaſured by it.

5. To make uſe of a ſcale of larger diviſions when you meaſure ſmall cloſes, and of ſmaller when you meaſure great ones.

6. To make your lines and points where angles meet, ſmall, pure, and neat.

7. To ſet on your chains and links at twice, when any line is too long for your ſcale.

Theſe things being premiſed, proceed thus:

I. Suppoſe a triangular field is to be meaſured with the chain, beginning at eaſtern angle A, Fig. 15. and find the ſides in their order and meaſure to be ſeverally thus; 2.29, 3.45, 4.07.

Making uſe of the leſs diagonal ſcale, becauſe the other would make the figure too large, otherwiſe it were more proper for ſo ſmall a cloſe, with your compaſſes take off the ſcale 4 chains and 7 links, and ſetting them from A to C, draw that line for the baſe, becauſe the longeſt of the three; then take 2 chains 29 links off the ſame ſcale, and ſet them in the eaſtern point A, and turning the looſe foot of the compaſſes above the line A C, deſcribe, at that diſtance 2.29, the arch E E.

Next taking with your compaſſes upon the ſame ſcale the extent of 3 chains 45 links, place one foot in the point C, and with the other make the arch F F, interſecting the former in the point B; and drawing the lines A B and B C, the triangle A B C is the plot of the triangular field meaſured.

But before you can give the content, you muſt find the length of the perpendicular, which is done by ſetting one foot of the compaſſes in B, and extending the other to the baſe A C, ſo as it touch it, and paſs not over it, for then the length of the perpendicular is between the points of the compaſſes, and being applied to the ſame ſcale by which the triangle A B C was made, it appears to be 1 chain 42 links. With the half whereof multiply 4.07, the length of the baſe, the content appears to be 0 acres, 1 rood, 6 perches.

The baſe 4.07
Half perpend. 0.71

407
2849

28897
4

1|15588
40

6|23520

II. Suppoſe you were to meaſure a quadrangular or four-corned field, begin as before at ſome remarkable angle; and going round the cloſe, find the ſides to be 9.04, 6.72, 8.46, 7.28, and the diagonal from that remarkable angle to the oppoſite angle to be 10.02; we begin to protract it thus:

Fig. 16. Having by the help of your ſcale and compaſſes drawn the diagonal 10.02, from the remarkable angle A to C, the oppoſite angle, make a triangle of it, and the firſt and ſecond ſides 9.04 and 672, and another after the ſame method of that diagonal, and the third and fourth ſides 8.46 and 7.28, ſo you have the trapezium A B C D.

Then by the help of your ſcale and compaſſes, you find the perpendicular of the triangle A B C to be 6.02, and of the other, viz. C D A 6.01, which added, are 12.03, whereof the half ſum is 6.01; by which, multiplying the baſe 10.02, the content of the field will be 6 acres, 0 roods, 3 perches.

The baſe 10.02
Half perpend. 6.01

1002
60120

6|02202
4

|08808
40

3|52320

Before we paſs any farther, let it be remembered,

1. Any quadrangular cloſe, or parcel of ground whatſoever, having right lines, may be thus meaſured, protracted, and computed.

2. The odd meaſure above perches, is not valuable here, nor in the former computations, being always under a ſquare perch; but in multangulars, where there be many remainders, they muſt be ſummed up, and the perches contained in them added to the content before found.

3. This laſt, and the following figures, are made, that they might not be too large, by a ſcale of 400 in an inch, *i. e.* by the leſs diagonal ſcale, each chain and link being counted two.

III. Fig. 17. If this multangular figure be conceived to repreſent a cloſe of ſeven ſides, which is to be meaſured, begin at the remarkable angle A, and going round the cloſe, find the ſides will be 3.11, 2.49, 2.47, 1.77, 4.11, 2.29, 4.37.

Then meaſure the four diagonals, B D, D F, F B, and B G, in the order you will find them to be 3.45, 4.97, 4.13, and 4.36, which is as ſhort a way as can be taken, to prevent unneceſſary walks.

But when you come to protract by the help of your ſcale and compaſſes, firſt make the triangle B C D of the firſt diagonal, and the ſecond and third ſides. Then the triangle D E F upon the ſecond diagonal, and fourth and fifth ſides; and upon the ſame diagonal, as a common baſe, the triangle B D F of the firſt, ſecond, and third diagonals.

Next of the ſame third diagonal, together with the 4th and 6th ſides, make the triangle B F G, and upon the fourth diagonal, as upon a common baſe with the firſt and laſt ſides, the triangle A B G. So is the whole cloſe plotted.

And

And now it ſtands viſibly reduced into two trapezias A B F G and B D E F, together with the triangle B C D, which we ſhall not now caſt up, having ſo often ſhewn how ſuch work is to be done.

But it muſt be acknowledged that this method of plotting parcels of land that have many angles, requires not only more care and pains, but better ſkill and memory, than to draw diagonals upon paper, when the plot is already taken by the plain table, or other ſtanding inſtrument. We ſhall therefore, to help our young practitioner in this caſe, advertiſe him of two eaſy ways to help myſelf, ſo as to be out of danger of miſtakes.

One way is, to divide the multangular field into two or more parts, as the laſt might have been by the diagonal B F; then might each part have been meaſured ſeverally, as if they had been ſeparated by a pale, or were ſundry men's lands parted by a boundary.

Another way that much helps both the underſtanding and memory, is, to draw a rude draught of the figure of the land you intend to meaſure, not only as to the ſides, but alſo neceſſary diagonals. Then meaſuring the lines upon the ground correſpondent to thoſe on the paper, ſet the lines as you meaſure them upon the lines of the draught, as if it were the true ones, and when you have finiſhed your meaſuring, protract it truly. Such as you ſee here, but it is better larger, will do your buſineſs; for it is not a pin matter how rude or falſe the lines or angles be, reſemblance being all that is deſired.

Concerning the meaſuring of circles, and their parts.

We have hitherto purpoſely abſtained from meddling with the circle, and its parts, that we might lay thoſe things cloſe together without unneceſſary mixtures, that are of greateſt uſe.

It is very rare, if a land-meter ever have occaſion to meaſure any field or parcel of land, that will prove either circle, ſemi-circle, quadrant, or ſector. Sometimes indeed there will be a little crook in an old hedge bowing like an arch; but we have never ſeen any offer to meaſure it as a ſegment, but always take it as an angle or angles.

Yet becauſe it may be expected we ſhould ſay ſomewhat of thoſe things, we ſhall briefly do it.

I. To meaſure a circle in the more exact way, is, to ſquare the diameter, and to multiply that ſquare by 7854; ſo ſhall the content be in integers and decimals.

But the more uſual and quick way, (and near enough for any uſe we ſhall make of it) is, to multiply the half of the periphery or circumference by the ſemi-diameter.

In like manner to find the content of a ſemicircle, quadrant, or ſector, made up of ſemi-diameters, and arched lines, multiplying the half arch by the ſemi-diameter, gives the content.

Fig. 19. But that which falls out moſt frequently in menſuration, though ſeldom much regarded, except where a curious exactneſs is required, is that particular ſort of ſegment which we call a ſection, leſs than a ſemi-circle, ſuch as this figure A B C. And to find the content of it, the center of the circle, whereof this is a ſection, muſt be firſt found, as here at O, from which lines drawn to A and B, make up the ſector A O B C; which being meaſured according to the laſt rule, and from the content thereof, the content of the triangle A O B ſubſtracted, the difference or reſidue is the content of the ſection A B C.

But two queſtions may be here demanded:

1. How may the center be found? 2. How may ſuch a portion of land be truly protracted and computed?

To the firſt we anſwer, that the moſt exact and artificial way, is, by making a mark any where in the arch.

As for example.

At the point C, and then, by a problem known not only to every ſurveyor, but to ordinary carpenters and joiners, for finding the center of a circle, whoſe circumference will paſs through 3 given points that are not in a right line, as A C B, to find the center O. But if you know not how to do it ſo, croſs the line A B in the middle, as here it is done by the perpendicular O C; ſo you may by a few trials find both the due extent of your compaſſes, and the point in the perpendicular that will fit your purpoſe near enough; for if a little error be committed in making up the ſector, the moſt of it goes off again in the ſubſtraction of the triangle.

II. For the latter, you may take this ready courſe: meaſure the length of both your lines, the chord and the arch, and their diſtance at the middle of them both; then, when you come to protract, firſt take the length of your right line from the ſcale, and having laid it down, croſs it in the middle at right angles with a dry line, as in the laſt figure, ſo ſhall it interſect the line A B in the point E; then from the ſame ſcale take the meaſured diſtance between the two lines in the middle, and ſet it upon that dry line from the interſection at E, to the point C. Then, by trials, find a due place in the dry line O E C, and ſuch a diſtance with your compaſſes, that the one foot reſting in that line, the other may deſcribe the arch A C B, and the ſection is protracted.

Concerning cuſtomary-meaſure, and how it may be reduced to ſtatute-meaſure, & e contra, *either by the rule of three, or a more compendious way by multiplication only.*

Though the ſtatute-perch or pole is 16 feet and a half, and no more, yet there are poles of larger meaſure uſed in many places, as of 18, 20, 21, 24, and 28 feet, nay, in ſome 22 feet and a half. It were therefore very convenient that our young ſurveyor were furniſhed with a chain fitted to the cuſtomary meaſure of the country where he lives. But becauſe theſe are too large and cumberſome for ſmall cloſes, it is very convenient, inſtead of one chain of 100 links, to make two of 2 poles apiece, each pole divided into 25 links, as that of 100 is; which two half chains may, in meaſuring large fields, be tied together by the loops with pack-thread, or joined by a buttoning key-ring for more ſpeedy diſpatch; but in ſmaller we may uſe the half chain of 50 links, only taking care that we count not half chains for whole ones.

And in theſe caſes where the poles are large, and the cloſes ſmall, it were ſtill more convenient if you had a chain of 2 poles only, divided into 100 links. Only you muſt then take notice, that whereas working by whole chains and links, the firſt multiplication, after five cut off, gives the content in acres and parts. The like work by half chains and half links, will give the content in roods or quarters of acres, and parts of ſuch roods.

But though it is no hard matter, for one that can find out the length of a link by dividing the number of feet in a chain by 100, and provide himſelf of good iron-wire and curtain-rings to make it of, and a ſharp-edged file, and round-noſed plyers to make it with, to be furniſhed with ſuch a chain, yet becauſe every one cannot do this, we ſhall ſhew how you may eaſily, and yet very truly reduce ſtatute-meaſure into cuſtomary, that ſo the chain before deſcribed may do your buſineſs all England over.

Know therefore, for a ground to go upon, that acres bear proportion to one another as the ſquare of their poles; and therefore if you multiply 33, the number of half feet in the ſtatute-pole, by itſelf, which gives 1089, and alſo multiply the number of half feet contained in a pole of that meaſure you would reduce into; in the ſame manner you may, by the rule of three reverſe, obtain your deſire, making to that purpoſe 1089 the firſt number, the ſtatute-meaſure the ſecond, and the ſquared half feet of the pole given the third. As for example: ſuppoſe of a cloſe meaſured by the ſtatute-pole, the length and breadth, and their product be as here repreſented in the margin. And it is deſired that the content may be caſt up according to the large Cheſhire meaſure of eight yards, or 24 feet to the pole or rod. Then before you cut off any figures, conſider that in the ſtatute-pole are 33 half feet, and in the Cheſhire pole 48; multiply therefore 33 by 33, and 48 by 48, and you will have, 1089 and 2304, which, together with the ſaid product, may be thus placed: 1089, 672693 :: 2304, and ſo multiplying 672693 by 1089, and dividing their product, being 732562677, by 2304, the quotient is 317952; from which, if 5 figures towards the right hand be cut off, the content, by this cuſtomary-meaſure of 24 feet to the pole, will be 3 acres, 0 roods, 28 perches, as here appears:

```
  9.33 L.
  7.21 B.
 -------
   933
  1866
 6531
 -------
 672693 prod.
```

```
  3|17952
        4
  -------
   |71808
       40
  -------
 28|72320
```


But

But if the lines on the land had been meaſured according to that cuſtom of 24 feet to the pole, and the content muſt have been found according to ſtatute-meaſure, then we muſt have multiplied the product by 2304, and have divided that latter product by 1089. And in the ſame method you may proceed in all or any of the reſt. But the truth is, that though this way be very exact, plain, and comprehenſive, ſuiting all the cuſtomary-meaſures before-mentioned without fractions, it is ſomething tedious, except the practitioner knows how to relieve himſelf by a large table of logarithms, which we cannot ſtand here to treat of. Therefore to contract the work a little, take notice, that all the cuſtomary poles being mentioned, ſaving only thoſe of 20 and 28 feet, which we ſuppoſe are ſomewhat rarely uſed, having never heard nor read of them, but in Mr. Holwell; all the reſt are capable of being divided into half yards: and therefore, if inſtead of ſquaring the half feet, you ſquare the half yards of both poles, and work with them, you will attain the ſame end without any regardable difference, the ſmall diverſity that there is, being generally in the uſeleſs remainders, not at all affecting the deſired quotient that gives the anſwer near enough for uſe.

As for example.

```
 11
 11
----
 11
 11
----
121
----
 16
 16
----
 96
 16
----
256
```

If we had ſquared 11 the number of half yards in the ſtatute-pole, which would make 121, and alſo 16 the number of half yards in the Cheſhire-pole, which would make 256, and then multiplied the firſt product 672693 by 121, the ſecond product would have been 81319853, which being divided by 256, the quotient would have been, as before, 317952. And this way is in a manner co-incident with Mr. Holwell's firſt method.

Take notice alſo once for all, that whether you uſe either of theſe or the following methods, you need not reduce the particular ſquares, triangles, or trapezia's ſeverally; but ſum up all their products together and then reduce all at once.

But if you would reduce ſtatute-meaſure into cuſtomary by multiplication only, take notice of this preſent table following.

The content by the ſtatute-pole being multiplied by	.84027	Gives the content by the pole of	18	Feet.
	.68062		20	
	.61734		$21\frac{1}{2}$	
	.53777		22	
	.47265		24	
	.34725		28	

The uſe of this table.

When you have multiplied lengths by breadths, or baſes by half perpendiculars, multiply theſe products by the decimal fractions anſwering to the cuſtomary-meaſure, into which you would reduce ſtatute-meaſure, and from that latter product, firſt cut off five places towards the right hand, as not to be regarded, being only parts of a ſquare link, then cutting off five more, and proceeding to multiply by 4, and then by 40, as hath been often ſhewn, you will have the content by that cuſtomary-meaſure.

Example.

Suppoſe the length of a cloſe meaſured by Gunter's chain, and multiplied by the breadth meaſured alſo by the ſame, produced 672693 ſquare links; and it is deſired, that the content may be given in Cheſhire meaſure of 24 to the pole; you muſt multiply 672693 by 47265, the decimal fraction anſwering to 24 feet, and from that product, being 31794834645, cut off and caſt away 5 places, and the reſt being 317948, are in the uſual way eaſily reducible into 3 acres, 0 roods, and 28 perches, as here appears, agreeable to what it amounted to in the former method.

```
3|17948
      4
-------
|71792
     40
-------
28|71680
```

But if you meaſured by a chain of cuſtomary-poles, and deſire to know what the content is in ſtatute-meaſure, this following table is for your purpoſe.

	Feet.			
The content meaſured by the pole of	18	being multiplied by	1.19008	gives the content by the ſtatute-pole.
	20		1.46923	
	21		1.61983	
	$22\frac{1}{2}$		1.85950	
	24		2.11570	
	26		2.87970	

To underſtand which, take this example.

Suppoſe the length and breadth of a long ſquare being meaſured by a chain of 24 feet to the pole, and multiplied together, make their product 317952, let this be multiplied by 2.11570, which anſwereth to 24 feet, and the latter product will be 67269104640; from which, if you cut off and caſt away 5 places towards the right-hand, the remainder is 672691; which, in the uſual way, is eaſily reduced to 6 acres, 2 roods, and 36 perches.

```
6|72691
      4
-------
2|90764
     40
-------
36|30560
```

One thing more, and we have done with this buſineſs of reduction. If the content to be reduced, be caſt up into acres, roods, and perches, reduce all into perches, and then in other reſpects work as before, either by the Rule of Three, or by this laſt method of multiplication only. So ſhall you have the content in ſquare perches, according to the meaſure deſired, which you may reduce into acres by dividing them by 160; and if any thing remain, that remainder being divided by 40, will give you the roods in the quotient, and the latter remainder the number of ſquare perches.

For trial of which rules, remember the anſwer of theſe two following queſtions wrought all three ways.

Queſt. 1. *How many acres, roods, and perches according to the pole of 18 feet, are contained in 5 acres, 3 roods, and 11 perches, ſtatute-meaſure?*

Anſ. 4 acres, 3 roods, and 22 perches, as here appears.

I. *Method.*

```
                A.  R.  P.
  33    36      5 : 3 : 11
  33    36      4
 ----  ----   ----
  99   216     23
  99   108     40
 ----  ----   ----
1089  1296    931

1089 . 931 : : 1296
      1089
     ------
      8379
     7448
    9310
   1013859

1296) 1013859 (782
      9072
      -----
      10665          160) 982 (4
      10368               640
      -----
       2979           40) 142 (3
       2592               120
       -----              ---
        387                22
```

II. *Method.*

```
 11    12      121 . 931 : : 144
 11    12            121
 ---   ---          -----
 11    24            931
 11    12           1862
 ---   ---          931
121   144
            144) 112651 (782
                 1008
                 -----
                  1185
                  1152
                  -----
                   331
                   288
                   ---
                    43
```

160) 782 (4
640

40) 142 (3
120

22

Or thus:

40) 782 (19
40

382
360

22

4) 19 (4
16

3

III. *Method.*

.84027
931

84027
252081
756243

782.291 37

160) 782 (4
640

40) 142 (3
120

22

Queſt. 2. *How many acres, roods, and perches of ſtatute-meaſure, are contained in* 8 *acres,* 3 *roods, (or quarters) and* 21 *perches of* 21 *feet to the pole?*

Anſw. 14 acres, 1 rood, and 21 perches, as appears by the three following works in the ſeveral methods.

I. *Method.*

A. R. P.
8 : 3 : 21
4

35
40

1421

42
42

84
168

1764

33
33

99
99

1089

1764 . 1421 : : 1089
1764

5684
8526
9947
1421

1089) 2506644 (2301
2178

3286
3267

1944
1089

855

160) 2301 (14
160

701
640

40) 61 (1
40

21

II. *Method.*

14
14

56
54

196

11
11

11
11

121

196 . 1421 : : 121
196

8526
12789
1421

121) 278516 (2301
242

365
363

216
121

160) 2301 (14 95
160

701
640

61
40) 61 (1
40

21

III. *Method.*

1.61983
1421

161983
323966
647932
161983

2301.77843

160) 2301 (14
160

701
640

40) 61 (1
40

21

How to meaſure a piece of land with any chain of what length ſoever and howſoever divided; even with a cord or cart-rope, being a good expedient when inſtruments are not at hand of a more artificial make.

If you can procure a chain, and find it is not divided as before hath been ſhewn, but into feet or quarters of yards, or any ſuch vulgar diviſions, make no reckoning of the diviſions at all, but meaſure it as exactly as you can find out the true length of the whole chain; and if it fit none of thoſe lengths mentioned before, nor any of their halfs, make it fit by taking off a link or two, or piecing it out with a ſtring; then dividing the length of that chain by 100, or the half of it by 50, find the true length of a link according to our artificial diviſions, and having got a long ſtick or rod, ſet as many of thoſe link-lengths upon it as it will hold; then may you meaſure all the whole chains by your regulated chain, and the odd links of every line by your divided ſtick or rod, as is manifeſt in this example following.

Being far from any inſtrument, and requeſted by a friend to meaſure him a cloſe, you muſt procure a pair of compaſſes, an ordinary carpenter's rule of two foot, divided into inches and quarters, and alſo with a piece of an old chain ſeemingly divided into feet, meaſure it by the rule, and finding it to be 45 feet long, and ſome odd meaſure, piece it out with a pretty ſtrong cord that will not ſtretch much, to 48 feet exactly; then it will ſerve for half a chain of 24 feet to the pole: this 48 multiply by 12, the number of inches in a foot, and that product being 576, divided by 50, the number of links in half a decimal chain, and the quotient is 11 $\frac{26}{100}$ inches, or 11 inches and an half, and a trifle over: dividing therefore a long ſtick throughout into ſuch parts, each containing 11 inches and a half, beſides the breadth of the nicks, you are provided of tools to meaſure lines to a link with exactneſs enough.

In like manner you proceed with a cord or rope, having fitted them to ſome known length or other; and then for protracting, it were eaſy with the compaſſes to make a plain ſcale of a large ſort, either upon paper, or an even piece of wood. This for once may ſerve a man's turn well enough.

Beſides, there is a way of meaſuring the perpendiculars of triangles and trapezias upon the ground itſelf, ſo as to prevent the neceſſity of a ſcale; for if you have a little ſquare with a hole in it to turn upon the head of a little ſtick, which you may fix where you pleaſe, as you are meaſuring the baſe of a triangle, or the diagonal of a trapezium, you may by a very few trials find the place where the one leg will be juſt in the line you are meaſuring, and the other point at the angle from which the perpendicular falls on it, and then the ſpace between your ſtick and that angle truly meaſured, is the perpendicular.

If you have not ſuch a ſquare, a ſquare trencher, or any end of a board that hath one right angle, and two true ſides, will ſupply the want of it.

And

And we shall make bold to add, that this is a good way to measure a trapezium, though it be protracted afterwards; for by measuring the perpendiculars as aforesaid, and observing at how many chains and links end the said perpendiculars meet the common base, the whole trapezium may be truly protracted without going about it; this little square competently supplying the place of an instrument, which is usually called a cross or square, made up, as it were, of two small indices, like those for a plain table, but much less, with fore-sights and back-sights, and cutting one another at right angles put together, and having an hole at the center.

Concerning dividing of land artificially and mechanically.

1. To divide a triangle into any parts required; divide the base as the demand imports, then shall lines drawn from the points of division to the opposite angle, finish the division of the triangle.

Example.

Fig. 20. A C, the base of the triangle ABC, being divided into 12 equal parts, a line drawn from the angular point B to the point 6, divides the triangle into two equal parts; 2 lines drawn to 4 and 8, divide it into three equal parts; 2 lines drawn to the points noted with 3, 6, and 9, divide it into four equal parts; and so lines drawn to 2, 4, 6, 8, 10, divide it into six equal parts.

Also it is very obvious, that if the same triangle were so to be divided, that the one part should be double to the other, a line drawn from B to 4 or 8, doth the work, or if it be required to divide it into two parts, so as the one shall be triple to the other, a line drawn from B to 3 or 9, compleats the work. So also a line from B to 2 or 10, divides it into two parts, whereof the one is quintuple, or five-fold, to the other, and a line from B to 1 or 11, divides it into two parts, whereof the one is 11 times as large as the other.

Farther yet, if it were required this triangle should be so divided, that the two parts should in quantity bear proportion, as 5 and 7, a line from B to 5 or 7, will answer the intention.

The divisions will indeed be sometimes a little more intricate than this, yet not such, but that the seeming difficulty may be easily overcome by observing the following method.

Suppose a large triangle of common land to be divided amongst three tenants, A, B, and C, according to the quantity of their tenements, A, having 19 acres of land to his tenement, B 13, and C 7, the base of the triangle being found by measure to be 17 chains and 27 links; and the demand is, where the point of the division must be placed in the base, so as lines drawn from thence to the opposite angle, shall truly limit each man's part.

To answer this, let us add 13 and 07 to 19, and they give 39: so is the work plainly reduced to the rule of fellowship; and therefore to find every man's distinct portion, we need only to multiply the base by his particular number, and divide that product by 39, the sum of all their numbers.

19
13
07
——
39

A

29 . 17.27 :: 19
19
——
15543
172
——
39) 32813 (841$\frac{14}{39}$
312
——
161
156
——
53
39
——
14

B

39 . 17.27 :: 13
13
——
5181
1727
——
39) 22451 (575$\frac{26}{39}$
195
——
295
273
——
221
195
——
26

C

39 . 17. 27 :: 7
7
——
39) 12089 (309$\frac{38}{39}$
117
——
389
351
——
38

From these operations it is plain, that if we set off from the angular point where the base begins, 8 chains, 41 links, and a little above the third part of a link upon the base for A, and where that ends, 5 chains and 75 links and $\frac{2}{3}$ of a link for B, and consequently leave between this second division and the other end of the base 3 chains and almost 10 links for C; lines drawn from those points of division to the opposite angle, will give each man his due.

What has been said touching the division of triangles upon their bases, will, with a little variation, serve for the dividing of all sorts of parallellograms, whether squares, long squares, rhombus's, or rhomboides; all the difference is, that instead of drawing lines from points in the base to the opposite angle, you must draw parallel lines from points in one opposite side to another, as will be sufficiently plain by this one instance.

Fig. 7. Suppose the square figure to represent a close of six acres, and you are to cut off an acre at the side A C; having set off the 6th part of the line C D, from C towards D, and also from A towards N, a parallel drawn between those points, takes off exactly a 6th part of an acre.

If it be not thought convenient, as in some cases it is not, to cut off a piece so long and narrow, you may by the Rule of Three find what other length of any greater breadth will limit an equal quantity to it. Or you may multiply the breadth by 2, 3, or any other, and divide the length by the same number that you multiplied the breadth by. Or lastly, if you set out a double proportion that is $\frac{2}{6}$ or $\frac{1}{3}$, from C towards D, and from the point where it falleth, draw a line to the angle A, you will have a triangle equal to $\frac{1}{6}$ of the square A C D N.

But to return to triangles, the most simple and primitive of all rectilinears, and therefore the most considerable in this case of partition, as giving laws often to the rest, it may fall out that a triangle must be divided, by a line from some point in a side, so as that line may either be parallel to some other side, or not parallel to any.

Fig. 21. Let A B C be a triangle given, and it is required to cut off $\frac{3}{5}$ by a line parallel to A B. First, on the line A C describe the semi-circle A E C, whose diameter C A divided into five equal parts according to the greater term, and upon three of those parts, the lesser term, erect the perpendicular D E, which cutteth the arch line in E; then set the line from C E from C to F, and from thence draw the line E G parallel to A B; so will the triangle CGF contain $\frac{3}{5}$ of the triangle A B C, as was required.

Fig. 22. Now, for the latter case, when the line of partition goes not parallel with any side, take this example:

Let A B C be a triangle given to be divided into two parts which shall bear proportion to one another, as 3 and 2, by a line drawn from the point D in the base, or line A C.

From the limited point D, draw a line to the angle B; then divide the base A C into five equal parts, and from the third point of the division draw the line to E parallel to B D. Lastly, from E draw the line E D. So shall the trapezium A B E D be in content as 3 to 2, to the new triangle D E C.

We shall have now done with the division of triangles, when we have added the three following advertisements.

1. You must be sure to take very exactly the distance of every point, where a dividing line cutteth any side, to one of the ends of the same side, as in this last figure, the distances BE and AD; which distances being applied to the scale by which the triangle was protracted, will shew at how many chains and links end you are to make your dividing line on the field itself.

2. The proportions by which you are to divide, are not always so formally given as in the former examples, but are

ſometimes to be found out by arithmetical working, as in this caſe.

Suppoſe a triangular field of 6 acres, 2 roods, and 31 perches, muſt be divided ſo as the one of the two parts ſhall be four acres, 3 roods, and 5 perches, and the other, conſequently, 1 acre, 3 roods, and 26 perches; reduce both meaſures into perches, and the one will be 765, and the other 306. Their ſum is 1701, which, by their common meaſure, being reduced into their loweſt terms of proportion in whole numbers, will be 5, 2, and 7, which ſhews that the triangle being divided in 7 equal parts, the one muſt have 5 of thoſe 7 parts, and the other 2. And obſerve, that it will be ſufficient to find the common meaſure between the ſum of your terms, and either of the terms; the method whereof is ſhewn in every arithmetic-book for reducing fractions into their loweſt terms.

But the reader may multiply either of the parts; as ſuppoſe 765, by the length of the baſe, which we will ſuppoſe to be 8 chains and 75 links, or 87 links; and that product divided by 1071, the content of the whole cloſe in perches, gives the rule of three direct, 625 links, or 6 chains and 1 pole, the true diſtance from either end of the baſe, that his mind or occaſions may direct him to begin with, to the point of diviſion; for the diviſion muſt be not only for proportion or quantity, but alſo as to poſition or ſituation of parts upon the paper, as it is required to be on the ground.

3. In theſe and all other diviſions of land, where a ſtrict proportion in quantity is to be obſerved, you muſt have reſpect to the rules given hereafter concerning meaſuring of uneven ground, eſpecially if one part prove much more uneven than another: and if there be any uſeful pond, or well to draw your line of diviſions through it; but if it be an uſeleſs pond, lake, or puddle; or if there be any boggy or barren ground, that muſt be caſt out in the diviſions, meaſure that firſt, and ſubſtract it from the content of the whole cloſe, and then lay the juſt proportion of the remainder on that ſide that is free from it, that the other may have its juſt part alſo, beſides that which is uſeleſs.

What hath been ſaid, with an ordinary meaſure of diſcretion, may ſufficiently inſtruct a young artiſt to divide triangles, parallellograms, and regular polygonials, in an artificial way; but becauſe many cloſes and open grounds are trapezias, and many irregular polygons, and even thoſe that are regular enough, may fall under an irregular diviſion, in regard of the quality of the land, woods upon it, or quaries in it, or the conveniences of ways, currents of water, ſituation in reſpect of adjacent lands, &c. we ſhall propoſe a method, which though it hath ſomewhat of the mechanick in it, will be ſingularly uſeful in ſuch caſes.

Let A B C D be a trapezium to be divided betwixt a young heir and his mother, ſo as his part may be double to her's. Having by the diagonal B C divided it into two triangles, you will find the content of the triangle A B C to be 138550 ſquare links, and the triangle B C D to contain 103468, in all 242018 ſquare links, which, if reduced, as hath been formerly taught, would amount to 2 acres, 1 rood, and 27 perches.

But for the preſent work, they are in a better order already. Dividing then 242018 into three parts, each of them is 80676 and $\frac{2}{3}$, two therefore of thoſe third parts muſt contain 161353 and $\frac{1}{3}$, which $\frac{1}{3}$ being inconſiderable, regard them not.

Then if you reſolve to lay out the double part towards the line B D, ſtrike at adventures the line E F, and meaſuring the trapezium bounded by that line, and the oppoſite ſide B D, together with the interjacent parts of the lines A B and C D, which you will find to contain 119140 ſquare links; but becauſe it ſhould have been 161353, ſubſtract 119140, out of 161353, and their difference is 42213, and perceiving that the lines A B and C D are very near parallel, and finding their diſtance where they are cut by the line E F, to be 326 links, or 3 chains and 26 links, divide 42213 by 326, and the quotient is 129 links, and almoſt half, at which diſtance draw the line G H parallel to E F; ſo ſhall the trapezium G B D H be the heir's part.

Another way whereby the ſame thing may be performed is this. Finding the triangle A B C to contain 138650 ſquare links, ſubſtract it out of the heir's part, viz. 161353, the difference 22803, ſhews how many ſquare links muſt be taken out of the triangle B C D, and added to the triangle A B C; which to perform with all neceſſary exactneſs, ſuppoſe the ſide or line B D to be the baſe, which by meaſure proves to be 344 links, or 3 chains and 44 links. Say by the Rule of Three direct, if the whole content of the leſſer triangle, viz. 103468, give 344; what ſhall 22803 give? So will the reſult be 75 links, and ſomewhat more than $\frac{4}{5}$, of a link, for 22803 multiplied by 344, gives 7844232, which being divided by 103468, the quotient is 75 $\frac{84132}{103468}$; or according to decimal diviſion, 75,8131, which is ſomewhat more than 75 links and $\frac{4}{5}$, wherefore extending your compaſſes upon the ſcale to almoſt 76 links, ſet that diſtance upon the line B D, from B to I, and draw the line C I: ſo ſhall the trapezium A B I C be double to the triangle I C D, within ſo ſmall a matter as is not worth regarding, though the land were a rich meadow.

We hope it will be unneceſſary to tell any man of ſenſe, that if he pleaſe he may begin with the leſs part, and take out that; or if there be many partners, he may divide betwixt any one and all the reſt, putting their parts together, and then by the ſame method ſub-divide amongſt them till each hath his due ſhare; nor to ſpend many words in telling him he muſt ſubſtract where he hath, by ſeparating a line at adventures, or by chooſing out a triangle, taken too much, as we added, when we took too little. Nor laſtly, that theſe methods are not only applicable to trapezias, but to any triangular figure whatſoever, whether regular or irregular.

Concerning the boundaries of land, where the lines to be meaſured muſt begin and end.

If there be no agreement between the parties concerned, for if there be, that muſt be obſerved, reaſon and cuſtom are the ſurveyor's guide.

The farmer ſpeaks loudly, that when a piece of arable or meadow-land, is let for a year to be ſown or mown, no more ſhould be meaſured, nor expected to be paid for, either to the letter or workmen, than the plow or ſcythe can go over. So alſo when a parcel of land is let for paſture by meaſure to a farmer, it ſeems very reaſonable, that all, and only ſo much ſhould be meaſured, as is uſeful to that purpoſe.

But commons to be incloſed are uſually meaſured, except it be otherwiſe agreed, to the uttermoſt bounds of every man's particular proportion, without any allowance for ditch or fence, every man being to make them upon his own of what breadth he pleaſes. Nor is this unreaſonable, for it is as good for one as another, and the rate paid to the lord is uſually very little, ſometimes nothing.

It is alſo very uſual in meaſuring betwixt lord and tenant, in caſe of leaſes for lives, and long terms of years, to extend the lines to the utmoſt bounds of the tenant's claim, taking in the very walls, hedges, and ditches: but this is accounted very hard, and oft proves very unequal among the tenants of a lordſhip, ſome being forced to make much more waſte of their ground this way, than others that hold as much or more. But where the cuſtom obtains, the ſurveyor muſt obſerve it; for it is others work to appoint what muſt be meaſured, and his only to meaſure truly what is ſo appointed. A good landlord may, and will be apt, to conſider it in his rates, and a bad one it is like will be tenacious of a cuſtom to his own advantage.

Laſtly, in caſe of a ſale by meaſure at a rate agreed upon per acre, no boundaries being ſpecified in the bargain, the rule is to extend the lines to the quick wood-row, that is, to the place where the quick wood actually groweth, or where, according to cuſtom, it ought to be ſet.

Containing a deſcription of the plain table, the protractor, and lines of chords.

Though what hath been already ſaid, may competently ſuffice to inſtruct the young artiſt in meaſuring a cloſe of land, yet, to advance him a degree higher in uſeful knowledge, we ſhall take occaſion to deſcribe unto him the plain table, which conſiſts of ſeveral parts.

1. The table itſelf, which is a parallellogram of wood fourteen inches and a half long, and eleven inches broad, or thereabouts, and for neceſſity may be made by an ordinary country workman of one board; but for neatneſs, convenience of carriage, and freedom from warping, it is uſually

usually made of three little boards joined together side ways, with a ledge at each end to hold them fast together, and upon the middle board a socket of brass fixed with three screws, and with a fourth to be fastened on the head of a three legged staff; of which anon.

2. A frame of wood fixed to it, so as a sheet of paper being laid on the table, the frame being forced down upon it, squeezeth in all the edges, and makes it lie firm and even, so as a plot may be very conveniently drawn upon it. This is usually made with joints for more easy carriage, but a plain one may suffice. Upon one side of this frame should be equal divisions, for drawing parallel lines both long-wise and cross-wise, as occasion may require, over your paper, and on the other side the 360 degrees of a circle projected from a center of brass conveniently placed in the table.

3. A box with a needle and card, to be fixed with two screws to the table, very useful for placing the instrument in the same position upon every remove.

4. A three-legged staff to support it, the head being made so as to fill the socket of the table, yet so as the table may be easily turned round upon it, when it is not fixed by the screw.

5. An index, which is a large ruler of wood, or rather brass, at the least sixteen inches long and two inches broad, and so thick as to make it strong and firm, having a sloped edge, by which we draw the lines, called usually the fiducial edge, and two sights of one height, whereof the one hath a slit above, and a thread below, and the other a thread above, and a slit below, so set in the ruler, as to be perfectly of the same distance from the fiducial edge. Upon this index it is usual to have many scales of equal parts, and there might be a diagonal scale if the instrument-maker please, and lines of chords of sundry lengths; but if you have such a scale as before described, you need not to have them here.

The protractor is an instrument so well known and so easy to be made and procured, that we shall be very brief in the description of it. As it is usually made, it consists of two parts, a scale and a semi-circle, but the scale is no necessary part of it, but serving, if you be not otherwise provided, for other uses before-mentioned in the case of plain scales.

But the semi-circle is more essential, and it may be made of brass, or other metal of any convenient size, as four inches, more or less, for the strait side, this semi-circle being bounded as all others are by two lines, the one right or strait, the other circular.

The right line is divided in the precise middle, by a point which is in the center, upon which the circular boundary is drawn, and two other arches concentrical with it.

The center, when the semi-circle goes alone without the scale, should be guarded with two little lips, on each side one, or a little loop, for more convenient turning of the instrument about upon a pin fixed in a paper.

The arched or circular edge is divided into 180 degrees, or equal parts, numbered by tens, upon the upper concentrick arch from 0 to 180, and in the lower from 180 to 360. So that by applying the strait edge of the protractor twice to any line, keeping the center right upon a pin fixed in the line, that is, with the semi-circle first above it, and then below it, or contrarily, you may draw a whole circle by the guidance of the arch, or set out any number of degrees, as will appear more plainly hereafter.

A line of chords is a line divided into 90 unequal parts, whereof 60, and the radius upon which the circle was drawn, are equal, and the divisions upon that line are equal to the next extent in a right line, of so many degrees from the beginning of the quadrant, as answer thereunto.

When lines of chords are cut upon wood, it is both usual and necessary that there be two studs of brass, the one at the beginning, and the other at 60 degrees, with little holes for the feet of the compasses, when you take the extent of the radius, to preserve the line from being wounded by the compasses; and being thus fenced, it will for need do the work of a protractor, but not altogether so commodiously.

How to take the true plot of a field by the plain table, upon the paper that covers it, at one or more stations.

There are three ways or methods for doing this work, two more usual and ordinary, the third more unusual and extraordinary, though now pretty well known to most surveyors, and in late books published. The first performs the work by measuring every line from the instrument to every angle, and is a very sure substantial way where it can be done, as it ordinarily may in most closes.

The second doth it by measuring only the station or the distances, and is very quick, but not so sure and exact as the other; yet, if managed by a skilful artist, that knows how to plant his instrument, so as to avoid making acute angles unnecessarily, it will come near enough the matter in many cases; as in measuring for workmen, that take the mowing or reaping of fields by the acre, or when tythes are let at a small value per acre, as in poor barren parishes they usually are.

The third is the way of circulation or perambulation, the instrument being oft to be planted, and the plot to be measured about; by which not only difficult closes, but even the thickest woods, yea, bogs, meres, and pools of water, may be plotted, which by neither of the other methods can be performed.

In all these methods, two things are to be performed.

1. At every angle where there is no perspicuous mark already, as a tree, bush, stile, &c. one must be placed, as a white paper, or such like; or else some one must go from angle to angle, and remain there as your mark to look at, till you bid him remove to another; only when angles are near you, this labour may be spared.

2. Whenever you have occasion to plant your instrument more than once, as it will often fall out in the first method, and ever in the two latter, you must be sure it stand just as it did the first time for situation; for which your needle, if well touched and hung, will be good direction, but is not thought sufficient without backsight and fore-sight. The first method is this.

I. When you go about to plot your parcels of land, find such a place in it, if possible, from whence you can see all the angles, and in that place plant your instrument covered with a sheet of paper, and turning it about till the needle playing at liberty, hang over the flower-de-luce, or any other notable place that you make choice of, screw it fast. Then choosing any convenient place in your paper for a center; and to represent your station, or place where you fix your instrument, make a prick with the small point of your compasses; to which prick applying the fiducial edge of the index, which is easily done if you keep the point of the compasses resting in it, direct the index, by the sight to all the angles; and when through the slit, or long sight, you see the opposite thread, cut the mark in the angle, draw a neat dry line along the fiducial edge, to or from the center; then measuring from the instrument to every angle, set the measure by a scale and compasses from the center towards the angle upon the line that points at it, making a prick in the line where the chains and links reckoned from the center truly end; then shall lines drawn by a strait line from prick to prick, give you the perfect plot upon your paper, which you may divide, as hath been before shewed, into trapezias and triangles, and so find the true content. To make which plain, mark this example.

Fig. 24. Suppose A B C D E F G H to be a field; having planted the plain table, as before directed, at a convenient advantage, so as to see all the angles, as at I, a prick to represent the station in the little circle ⊙ marked with I; upon which laying the fiducial edge of my index, and directing the sights to all the angles, draw dry lines toward A, and all the rest of the angles in order from the center; and then measuring upon the ground from the instrument to the angle A, find it to be 3.45, which set from the center to the point A, and so upon all the rest according to their due measures, and then black lines drawn from point to point, as from A to B, from B to C, &c. limit the true figure of the field according to the scale used, viz. of 400 in an inch.

And now, before we pass to farther varieties, let the reader take notice of these following things.

1. From henceforth we shall forbear to take any notice of the measures of lines measured from the instrument to the several angles, having so often shewed how to measure by a scale.

2. When we speak of measuring from or to the instrument, we always mean from or to that part of ground that

that is perpendicularly under the head of the inftrument, where you are to draw your plot, which will ever be enclofed with the three legs of your ftaff.

3. That it is ufually the quickeft way to meafure firft from the inftrument to the firft angle, and then back from the fecond angle to the inftrument, and fo the reft in order, ftill one from the inftrument, and the other to it.

4. It is no matter at all whether your plain table be placed towards the middle of a field, as was reprefented in this figure, or at an angle, as will appear hereafter.

5. In all workings by this inftrument, you muft have a care that the inftrument be not moved out of its due place, till you have finifhed the work of the prefent ftation; for which purpofe, caft your eye now and then upon your needle, obferving whether it continue to hang directly over the fame point you fet it at when you began your work, and to rectify your inftrument if you fee caufe. But becaufe all tables have not needles, and where needles are, they are not accounted very accurate, make ufe of the following help.

When you have planted your inftrument, and made a point or prick in your paper, reprefenting your ftation, fet the fiducial edge of your index to it, and turning it foftly about till you find one remarkable thing or other upon one fide of the clofe, and another on the oppofite fide, as you look through the fights of your index, which we call fore-fight and back-fight, draw a remarkable line with ink, or rather with a black-lead pen quite over your paper, which in this figure is prefented by the black line K L; and then, if you fufpect that by any accidendal jog, or other cafualty, the inftrument is any thing removed, you may eafily try, and rectify it by applying the fiducial edge to the fame line, and making ufe of fore-fights and back-fights again upon the fame marks which you before obferved upon the oppofite fides of the clofe.

But if there be no convenient place for the placing of your inftrument, whence you may fee all the angles of the field, more ftations muft be made ufe of thus.

Fig. 25. Let A B C D E F G H I K L M N be a field whofe angles cannot be all feen from any one angle, or other place in it. Plant your inftrument at the angle A, and if it have a needle, mark what degree of the chord it cuts, or turn about the table on the head of the ftaff, till the needle hang over fome remarkable place, as fuppofe the flower-de-luce, and fcrew it faft; then fetting up a ftick with a white paper or cloth on the head of it, where you intend your fecond ftation, as here at Q, make a prick or point in your paper, to fignify the point A upon the paper on the table: to which point you muft apply the fiducial edge of the index, and when you fee the white at Q, fo as looking through the flit you fee the thread cut it, draw the line O P quite through the paper with a black-lead pen, and then keeping the fiducial edge ftill upon the fame point, and turning it round by degrees, look at the angles B C D E F L M N, ftill drawing dry lines with the points of your compaffes, and fetting on the meafures from the ftation A, to every angle meafured to or from, as in the laft example.

Then remove the inftrument to the place of your fecond ftation, having fet up a mark at A, and laying the fiducial edge to the line O P, turn about the table upon the head of the ftaff, till through the flit of the back-fight, you fee the thread cutting the mark at A, and then fcrew it faft; fo will the needle, if a good one, hang directly over the fame point that it did at the firft ftation; but however that be, fore-fight and back-fight will do the bufinefs; for which purpofe it is good to take back-marks as well as fore-marks at every ftation, as was taught in the example of a fingle ftation, only taking notice that the back-mark, when the inftrument is planted in an angle, muft needs be out of the field; as fuppofe here at O.

Having meafured the diftance between the firft and fecond ftation, and finding it to be 7, 10, fet it upon the line O P, from A to Q; where make another point to reprefent the fecond ftation, and turning about the index with the fiducial edge upon that point, and fo looking through the fights at the angles G H I K, draw lines towards them on your paper, and having meafured between every one of thofe four angles, and the inftrument, fet thofe meafures, as you did the other, with your fcale and compaffes, from Q towards every angle upon his proper line; and then having the drawn black bounding-lines from A to B, from B to C, and fo round about the clofe, the protraction is finifhed.

But here to make this figure yet more advantageous, remember the following advertifements.

1. Sometimes a ftation is fo taken, that you may meafure towards two angles at once, as here from Q to G and H, in which cafe you are to fet down the chains and links where the firft angle falleth, but ftill be proceeding to the farther angle, caufing the remainder of the chains at the fore-end to advance beyond the former angles; fo going on with whole chains fo far as you can, to which the odd links at the end are to be added.

2. If at any of your ftations, as fuppofe A, you can fee an angle, for example E, to which you cannot meafure in a direct line without paffing the boundaries of your parcel of land given to be meafured; you may notwithftanding take in that angle by a ftrait meafured line, as we have done, provided it may be lawfully done without trefpafs, and conveniently without troublefome paffing of fences, otherwife it muft be taken from another ftation.

3. One of your ftations was here taken at an angle, and the other within the body of the field, to fhew the variety of working taught by other authors, and that it is no great matter where you make your ftations, fo you can fee the angles; elfe it had been full as convenient to have taken the firft ftation alfo within the body of the field, as fuppofe at R.

4. Though this figure reprefents to your eye only two ftations, A and Q, your fancy may multiply them at pleafure; for fuppofe the angle H could not have been feen from A to Q, how eafy had it been to have fet up a mark at S, and then to have removed the inftrument thither, obferving the fame directions that were given at the removal from A to Q?

II. In the fecond method the inftrument is to be planted twice, or oftener, as occafion requires, the rules for removal of the inftrument fore-fight and back-fight, and meafuring the diftance of ftations, being the fame as formerly taught; but inftead of meafuring to and from every angle, we only view each angle through the fights from two ftations, having applied the fiducial edge to the points reprefenting thofe ftations, and having drawn lines with the point of the compaffes, or a protracting-needle, the interfections reprefent the angles, from which the boundary-lines may be drawn; fo is the field protracted. Which that the reader may underftand, let him note thefe three figures.

Fig. 26, 27, 28. In thefe three figures the angles are marked alphabetically, A B C D E F, &c. and the ftations by a fmall point in a fmall circle numbered, 1, 2, or 1, 2, 3, according to their number and order.

Fig. 26. The firft of thefe figures reprefents the plotting of a field at two ftations within it, from both which all the angles may be feen.

Fig. 27. The fecond performs the fame work by two ftations taken without the field, by which art a clofe may be meafured, though the prefent poffeffor will not give us leave to come into it.

Fig. 28. The third fhews how the work may be performed at three ftations or more, when two fuch places cannot be found whence to view all the angles; which laft having more of difficulty than the two former, though indeed not very much, and the explanation of that will fufficiently help to the underftanding of them, we fhall a little explain the meaning of it in thefe particulars.

1. From the firft ftation taken according to the former directions, you fee the angles A B C D F G K, and accordingly draw lines upon your paper towards them from the point reprefenting that ftation, by the fiducial edge of your index with the point of your compaffes.

2. Having removed the inftrument to the fecond ftation, and in fo doing, obferved the rules before given, you will thence fee the angles A B C D E F G H I K, and draw lines upon your paper towards them from the point reprefenting the fecond ftation. And now viewing my work, you find upon your paper interfections for the angles A B, D F, G K, but only fingle lines toward the angles C E H I; therefore,

3. Removing the inſtrument regularly as before, to a third ſtation, you will thence ſee thoſe four angles C E H I, and drawing lines towards them, you will have interſections for them alſo; ſo that having drawn the lines A B B C, &c. from one interſection to another, you have the field perfectly protracted. For theſe bounding-lines from angle to angle, do not only ſignify the boundaries of a piece of land given to be meaſured, limiting the figure or ſhape thereof, and are to that purpoſe given in this and all other ſurvey-books, but alſo are the true diſtance by a ſcale from angle to angle for the plot upon the paper; we mean by the ſame ſcale by which the ſtationary diſtances were laid down upon their own lines. And this holds true in all kind of true plotting, whether in this method or any other.

III. The third method is that of circulation; and this hath ſeveral varieties, according to theſe three following caſes.

1. When the diſtance from angle to angle, without any exception, is meaſured quite round the plot, either within or without.

2. When the diſtance is taken only between ſome more notable angles, and the perpendiculars of the reſt meaſured as you paſs along their baſes, within the plot, proper for plain ſolid ground.

3. When the like is done without the plot, as in caſe of plotting thick woods, meres, pools, bogs, &c.

The firſt of theſe are very eaſy, conſiſting in nothing but planting the inſtrument at every angle, either within or without, as neceſſity and convenience determine it, obſerving the former directions for planting and removing the inſtrument, and alſo for meaſuring the ſtationary lines on the ground, and protracting them on the paper, as is manifeſt in this example.

Fig. 29. Let A B C D E F be a park-pond or cloſe to be protracted, firſt plant your inſtrument at A, and direct the ſights to a mark in the angle B, drawing a dry line from a convenient point on your paper towards B, on the ground, then having meaſured by your chain the diſtance A B, ſet it by a ſcale upon the correſpondent line from A to B, drawing a black line between them with ink or a lead pen, the extremities whereof are the points A and B on the paper, and the little pricked line that goes beyond B, repreſents the remainder of the dry line drawn at random, as to length, with the point of the compaſſes.

Then ſetting up a mark at A, if there was none before, remove your inſtrument to B, and laying the fiducial edge to the line A B, turn about the inſtrument upon the ſtaff, till through the ſight you perceive the thread cutting the mark at A, and the needle directly over the ſame point, that it was when it was planted at A; and ſo ſcrew it faſt.

Your next work is to lay the fiducial edge to the point B, and direct the ſights to C, drawing a dry line towards it, and ſetting the diſtance B C meaſured by the chain from B to C.

In this manner you are to proceed, ſurrounding the cloſe till you come at laſt to A, where you began, by planting the inſtrument at every angle, uſing the help of back-ſight and your needle, as at B, and then from the point repreſenting your preſent ſtation, directing the ſight to the next angle, as you did from B to C.

In the ſecond caſe, we do not plant the inſtrument at every angle, but at the more conſiderable, taking in the ſmaller by their perpendiculars from the baſe as we paſs along; of which the following figure may be an inſtance.

Fig. 30. Let A B C D E F G H I K L be a cloſe to be meaſured; by planting the inſtrument only at A C F and K, we have the main ſubſtance of the cloſe in the trapezium A C F K; and for the five ſmall triangles which muſt be added to the trapezium, they may be eaſily protracted by the help of ſuch a little ſquare as was formerly mentioned; for by finding at how many chains and links diſtance from A upon the ground, the perpendicular B *b* falleth upon the line A C; and having meaſured the length of that perpendicular, and taken in between the compaſs-points of the ſcale, we erect a perpendicular of that length at b, which is the point upon the paper, where ſo many chains and links determine, as were meaſured upon the ground, from the angles A, to the place where the perpendiculars fell on A *c*, viz. at *b*. Juſt in the ſame manner we raiſe the perpendiculars D *d*, and G *g*, I *i*; and then by the help of the perpendiculars, we draw the boundary lines A B, B C, C D, D E, F G, G H, H I, I L, K L, L A: which, together with the line E F between the angles E and F, give the true plot of the field in one large trapezium, and five ſmall triangles ready for caſting up.

The third caſe is like the ſecond, ſo that there needs no new direction concerning it, but to annex one plain diagram; all the difference conſiſting in this, that becauſe we cannot go within it, being ſuppoſed to be ſome pool, bog, or thicket, we muſt of neceſſity go on the out-ſide, and conſequently all the triangles made by inward angles, and their lines upon the meaſured baſes, muſt be excluded, by the boundary-lines, from being any parts of the plot.

Fig. 31. Suppoſing A B C D E F G H I K L M N O P to be a great pool, though here be fifteen angles, plant your table only five times, viz. at A E F H and M, and upon the dry lines A E, F H, H M, and M A, raiſe their perpendiculars in their proper places, and alſo of a right height; by which, and the five ſtationary angles, we may draw the bounding-lines of the plot, excluding all the triangles as foreign to it, they being no reſemblances of any part of the pool, but of land adjacent.

Concerning the plotting of many cloſes together, whether the ground be even or uneven.

Though we do not deſign to make the reader able to ſurvey lordſhips and foreſts, much leſs to draw maps of countries, but to meaſure a parcel of land with truth and judgment; yet we would have him ſo expert, as not to be puzzled, if any ſhould deſire him to draw a true map of a tenement or ſmall demeſne, conſiſting of ſeveral cloſes; for which purpoſe, let him obſerve the following method.

Fig. 32. Suppoſe A B C D E F G H I K L M to be a tenement or ſmall demeſne, divided into fourteen cloſes, to be meaſured and protracted according to their ſeveral ſhapes and ſituation, firſt draw the plot of the whole by the method of circulation, planting your inſtrument either at every angle, or only at the moſt conſiderable either within or without, as you find moſt convenient. This being done, a line from B to M, gives the triangle A B M from the firſt cloſe. In the next place go round the ſecond cloſe beginning at M, then to B, and ſo about to M again: and then for the third cloſe, plant your table at C, and go round to B, the line B C being protracted already, and ſo of all the reſt, ſtill obſerving which are common lines belonging to ſeveral cloſes, repreſenting the fences, that you may avoid the trouble of meaſuring thoſe lines oftener than once, and lay every part of every cloſe in its due place; and be ſure to keep the inſtrument throughout the whole work to its true poſition by needle, fore-ſight, and back-ſight.

There are divers other ways of doing this work, but none more ſure or plain, eſpecially if the ground be uneven; for in that caſe, if you protract according to the length of lines meaſured from your ſtation to the angles, you will put your cloſes into unproportionable ſhapes, except you reduce hypothenuſal lines to horizontal, by inſtruments, or otherwiſe, which is ſomewhat troubleſome; and the like may be ſaid when you plot with the chain only. Indeed the method of meaſuring only the ſtationary diſtances were very proper for ſetting out the figure of each particular cloſe, provided the diſtance of the ſtations be large, and taken, if poſſible, upon pretty even ground, which ſometimes may be done, though moſt of the cloſe be uneven; and the work ſo ordered, as not to make too accute angles; but becauſe this requires ſkill and care, we adviſe the young artiſt to uſe the circling way, as generally moſt commodious.

It is convenient when you plant your table, that the needle hang juſt over the north-point of the compaſs under it in the box; then may you by the lines overthwart the frame of the table, eaſily draw two lines quite thro' the plot, cutting one another at right angles, the one pointing at north and ſouth, and the other at eaſt and weſt. And if you mark the two and thirty points of the compaſs upon the place where they interſect, and draw the forms of the houſes, woods, and other remarkable things upon the demeſne, and the courſe of brooks and rivers running through it, it will add to your commendation.

And

And so it will also, if you take in such parcels of land bounding it, whether common or peculiar to other men, as will make your plot look handsomely, like a perfect square or oblong. But however that be, you must be sure to protract truly all lanes going into it, or through it, and all closes of other men's mixed with it; and also all considerable ponds, ways, and out-lets, with the names of the closes, and quality of the ground, whether meadow, pasture, arable, &c.

Concerning shifting of paper.

In work of this kind, it sometimes happen through the multitude and largeness of fields, that one sheet will not hold your whole plot; in which case you may help yourself by shifting paper, as we call it, thus.

Fig. 33. Let A B C D represent the sheet of paper that covers the table, upon which the plot of the large piece of land E F G H I K should be drawn; having finished your first station at E, and the second at F, and find your paper will not receive the line F G, draw it so far as it will go to the edge of the paper, and planting your table again at E, proceed in your circulation the contrary way to K and I, where you will find yourself again at a loss for your line I H, but draw it also to the edge of the paper; then with the point of your compasses striking the line P O parallel to the edge of the paper B C, and the line Q O parallel to D C, and cutting P O in O, throw it aside for a while, covering the instrument with a new one, which mark with the figure (2) for your second sheet.

Fig. 34. Upon which second sheet, the leading part whereof is represented by the three lines meeting in the angular points, A and B, draw P O parallel to A B, the leading edge of the paper, and crossing it at right angles in the point O, by a parallel to B C, viz. the line O R, being of the same distance from B C, that Q O in the former sheet was from D C; then with a rule and a sharp penknife cut off the end of the first sheet at the line P O, and applying the edge of it to the line P O of the second sheet, so as it may touch that line all along, and the line Q O of the former touch the line O R in the latter, so as to make one line with it, draw the lines P G, being the remainder of the line F G, and the line O H, being the remainder of the line I H, and from their extremities the line G H. And if the plot required it, you might proceed on in the second sheet, and annex a third and a fourth, &c. as there is occasion.

These sheets may be pieced together with mouth-glew or fine paste, applying the edge of the former, as you did upon the table, to the line P O of the latter.

And note here once for all, that when we speak of applying the edge of the paper to a line, we mean the precise edge cut by the line P O; but when we speak of drawing lines to the edge of the paper upon the table, we hope none will think us so absurd as to mean the edge that is concealed under the frame, but that the meaning is, that the lines must be continued on the paper till they touch the frame.

Concerning the plotting of a town-field, where the several lands, butts, or doles, are very crooked: with a note concerning hypothenusal, or sloping boundaries.

Fig. 35. Suppose A B C D E divided, in the manner of a common field, into seven parts or doles, belonging to seven several men: first, plot the whole, as before hath been taught, then measuring from A to B upon the land, note down, as you go along, at how many chains or links, or both, the division is between dole and dole, and accordingly mark them out by the help of scale and compasses in the line A B on the paper-plot. In the very same manner you must measure and mark out the lines O C and E D; which being done, take the paper from the instrument, and laying it before you on a table, with the side A E towards you; the compasses must be so opened and placed, as by a few trials they may, that one foot resting upon the table, the other may pass through the points of division upon all the three lines, viz. A B, O C, and E D, as in this figure they do.

If the content of any one or more of these parts, butts, or doles, be desired without plotting, it may easily be done, without your plain table, thus: take the breadth by your chain at the head, middle, and lower end, and adding these numbers together, the third part of their sum is the equated breadth; by which multiplying the length measured down the ridge, or middle, the product gives the content.

But both in this case, and that mentioned before, the figure of a plot may be somewhat disordered, not only by the unevenness of the ground within, but also by the great declivity of the ground where the boundary lines go, either of the whole plot, or particular parcels. For whereas in plotting, every line is presumed to be horizontal, or level, that it may pass from angle to angle the shortest way, and that every part may be duly situated, and none thrust another out o its right place, if it be not level, but falling down towards a valley, or rising up hill, or compounded of both, a line over such ground, will be false as to the plot, and therefore must be reduced to a level, and so taken off the scale, and protracted. For the doing of this, there are several instruments very proper, especially Mr. Rathburn's quadrant upon the head of his perać‌ter, and divers others. But suppose our country friend to have no other but such as we have already described, we shall shew him a plain easy way much used by practical surveyors.

Fig. 36. Suppose A B C to be a part of a hill falling within your plot, your boundary line going crookedly from A to B, following the surface of the ground. To find the horizontal line, equal to A C, cause one to stand at the point A, the foot of the hill, and to hold up the end of the chain to a convenient height, and gently ascending the hill, you must draw it level, and make a mark where it toucheth the hill, observing the number of links betwixt your assistant's hand, and that place where he must take his second standing, and hold it up as before, and so draw it out level again, till it touch the place where he must take his third standing, noting the links as before, and so proceed, till at last, from his fifth standing, you draw the chain level to the highest point within your plot, viz. the point B. And now as the pricked lines of this figure put together are evidently equal to the line A C, so are the links noted down at every station, when summed up, equal to the horizontal line of that part of the hill.

In the very same manner, only inverting the order, you may find the horizontal lines going down hill, where that is most convenient: and if there be both ascents and descents in one line betwixt two angles, the horizontal lines of both must be found and joined together in protraction.

All this concerning declivities of rising or falling ground, is to be understood when they are considerable, and a very exact plot required; for small ones, especially when much exactness is not expected, are not regardable.

Concerning plotting a piece of ground by the degrees upon the frame of the plain table several ways, and protracting the same.

Hitherto we have shewn the use of the plain table as such, and our directions have been near as plain as the instrument itself. We will now shew how the plot of a field may be taken by the degrees on the frame by two methods, whereof the one is proper for an ordinary close, where all the angles may be seen from one station within it, the other fitting any parcel of land, though much larger, whatever be the figure of it.

For the former, take this example.

Fig. 37. Let A B C D E represent the figure of a field to be plotted by the plain table in rainy weather, put on the frame without a paper, the graduated side upwards, and plant it in some convenient place, whence you can see all the angles, as at O; then placing the index upon the table, so as the fiducial edge may, at the same time, go through the center upon the table, and the lines upon the frame of the table cutting it perpendicularly at 360, where the degrees begin and end, and 180, the exact half, turn about the table upon the staff-head, till through the sights, the side marked with 180 being next your eye, see the angle

gle A, and then ſcrew it faſt, obſerving where the needle cutteth, and by back ſight cauſing a mark to be ſet up in the line C D at the point F, that the inſtrument may be kept firm from moving, or be rectified if it be moved, during the work. And now the line A O F paſſing upon the land from the angle A, directly under the ſights of the inſtrument to the mark at F, is, as it were, the prime diameter whence the degrees of the angles are to be numbered, and accordingly you muſt mark the angle A in the table hereafter to be exemplified with 360 degrees. Then turning the index with the fiducial edge upon the center, till you ſee the thread cutting the mark at B, the ſaid edge will cut upon the frame at 76 deg. 15 min. which note down for that angle. The like muſt be done, turning the ſights to C D and D, but not to F, for there is no angle, but only a mark in the boundary, and you will find the index to cut for every angle as we have marked them within the pricked circle of the laſt figure, viz. 157 deg. 35 min. for C, 225 deg. 20 min. for D, and 278 deg. and 50 min. for E.

Then meaſure, or cauſe to be ſtrictly meaſured by others, the diſtances betwixt the place where the inſtrument ſtands, and every angle, and you will find them to be as ſet down upon the pricked lines in the little circle, viz. A 4 chains 20 links, B 4 chains 3 links, C 3 chains 84 links, D 5 chains 35 links, E 5 chains 6 links. And now your table both for lines and angles is thus perfected, and the work is ready for protraction within doors.

	D	M	C	L
A	360	00	4	20
B	76	15	4	03
C	157	35	3	84
D	225	20	5	35
E	278	50	6	06

Your judgment will eaſily inform you, that in ſuch weather we ſhall hardly ſtand to make our table neat and formal, but any thing, how rude ſoever, that we can underſtand, doth the feat. A Welſh ſlate with a ſharp ſtile, or for want thereof, a black-lead pen, and a ſmooth end of an hard board like a trencher, is more convenient at ſuch a ſeaſon, than pen, ink, and paper. But of all, we would commend for expedition a red-lead pen, whereby you may mark out every angle neatly with one touch upon the table itſelf, juſt where it toucheth the frame by help of the fiducial edge, and cloſe by it the length of the line from the center to that angle: all which may be eaſily cleared off by a wet ſpunge or cloth ſo ſoon as you have protracted.

Fig. 37. Now to protract our obſervation; draw upon a paper the line A F at adventure, ſo it be long enough, and ſtick a pin in it at pleaſure for the center O, upon which place the center of the protractor, ſo as the ſtraight ſide may juſt lie upon the line A F, the limb or arch-ſide being upwards towards B; by help whereof make a prick or point on the paper 76 degrees 15 minutes for B, and at 157 degrees 35 minutes for C, according to the number neareſt to the limb.

Then turning the protractor about on the pin with the arch or limb down towards D and E, till the diameter lie again juſt upon the line A F, number downwards from the right hand towards the left, by that rank of figures that are nearer to the center, beginning 190, 200, &c. and over againſt the places where 225 degrees 20 minutes and 278 degrees 50 minutes fall, prick the paper at the ſide of the limb, and through thoſe four points draw ſo many ſeveral lines, upon which, and alſo upon the line A O, mark out by points the true meaſure of every line, by a ſcale, from the center, and from thoſe points drawing the lines A B, B C, C D, D E, and E A, you have the true plot of the field.

Having proceeded in the field as before, and made your table for lines and angles, or done that which is equivalent by a red-lead pen, draw the line A F, and having extended the compaſſes to the radius, or 60 degrees, on a line of chords, ſet one foot towards the middle of the line A F, and with the other deſcribe a circle like that in this figure of a five angled field, but much larger, according to the length of the radius: then extending the compaſſes from the beginning of the line, to 76 degrees 15 minutes, ſet one foot in the interſection of the circle by the line A, and with the other foot make a mark in the circumference of the circle upwards, towards the right hand, and through it draw the dry line B O.

In the next place ſubſtract the angle 76. 15 from 157. 35, where the index cut for the angle C, and there remains 81 degrees 20 minutes, which take off the line as before, and ſet it upon the circumference from the interſection by B O, toward the end of the diameter marked with F, and through the point where it falls, draw the dry line C O.

In like manner ſubſtract 157 degrees 35 minutes from 225 degrees 20 minutes, and the difference is 67 degrees 45 minutes, which ſet from the interſection by the line C O, downwards paſt the prime diameter A F, and through the point where it falleth, draw the line D O.

Laſtly, having ſubſtracted 225 degrees 20 minutes from 278 degrees 50 minutes, there remains 53 degrees 30 minutes, which muſt be ſet downward towards the left-hand from the interſection by D O; and through the point where that falleth, draw the line E O. And now having ſet the particular meaſures upon every line, and drawn the boundary lines, as you muſt have done if you had uſed a protractor, the plot is finiſhed.

But for better aſſurance that you have done your work well, take the meaſure of the remaining angle A O E upon its proper arch, viz. from the interſection of the circumference by A F, to the interſection by E O, and applying it to the line of chords, you will find it to be 81 degrees 10 minutes, as it ought to be, for it ſhould be the complement of 276 degrees 50 minutes to 360.

And for farther ſatisfaction, ſum up the degrees and minutes of all the five angles, which for plainneſs-ſake we have noted in every one of them on the out-ſide of the circle in the figure ſo often referred to, and their ſum is 360, as it ought to be.

76. 15
81. 20
67. 45
53. 30
81. 10
360.000

The reader may now expect that we ſhould teach him how to take a plot at two or more ſtations, when all the angles cannot be ſeen from one: but becauſe this is ſo eaſy from the principles already laid, to any that is ingenious, and in part rendered unneceſſary by the method preſently following, we ſhall only give this general hint.

When you have from one ſtation taken in all the angles you can ſee from thence, and then are to remove to your ſecond ſtation, do juſt as you would do if the table were covered with a paper; only it is at your choice, whether you would guide your ſelf for back-ſight by a line that may be rubbed off, drawn upon the table itſelf, from the center to the degrees, on the frame along the fiducial edge, or by noting only what degrees it cuts on either ſide of the center, the edge paſſing through it, that by the help thereof and the needle, the inſtrument may be placed in the ſame line and ſituation as before, for taking in the reſt of the angles, if it can be; if not, another ſtation muſt be taken after the ſame manner.

Fig. 38. Let A B C D E be the figure of a field to be plotted, the weather being bad; ſend your aſſiſtants to find the length of every ſide, beginning at A, who return you ſuch an account of every ſide, in chains and links, as are noted upon the figure, and in the table following, viz. A B 3 chains 73 links, B C 4 chains 91 links, &c. In the mean time you are to find the angles; in order to which plant the inſtrument at B, and laying the index on the center look at C, and find the index cutting 10 degrees 15 minutes, and looking at A, it cuts 126 degrees 45 minutes; out of which if you ſubſtract 10 degrees 15 minutes, there remains 116 degrees 30 minutes for the angle A; but becauſe it will not be ſo convenient to ſubſtract there, you may ſet them down thus:

$B\begin{matrix}A & 126.\ 45\\ C & 10.\ 15\end{matrix}$ the meaning whereof is, that B notes the angle, and C A the lines meeting there, cutting ſuch degrees on the frame; and the reaſon why A is ſet above, is for more ready ſubſtracting afterwards; then removing to the angle C, and thence looking at B and D, you will find the index to cut as is here expreſſed, $C\begin{matrix}B & 153.\ 10.\\ D & 15.\ 40.\end{matrix}$

In like manner at D thus, $D\begin{matrix}C & 96.\ 05\\ E & 28.\ 50\end{matrix}$

At E thus, $E\begin{matrix}D & 141.\ 20.\\ A & 11.\ 45.\end{matrix}$

And

And laſtly, at A thus, A $\begin{matrix} E & 98.\ 30 \\ B. & 9.\ 20 \end{matrix}$

An.	D	M	Side.	Ch.	L.
A	89	10	A B	3	73
B	116	30	B C	1	91
C	137	30	C D	4	88
D	67	15	D E	9	64
E	129	35	E F	2	29

This being done, you may retire under covert, and by ſubſtraction find 116 degrees 30 minutes for the angle B, 137 degrees 30 minutes for C, 67 degrees 15 minutes for D, 129 degrees 35 minutes for E, and 89 degrees 10 minutes for A, as you will find them on the figure, and in this table, together with the length of the lines.

Note, that there is a way to find the angles without ſubſtraction, if at every ſtation you lay the fiducial edge over the center, and the diviſions 180 and 360, turning about the head of the inſtrument upon the ſtaff, till through the ſights you ſee one of the neighbouring angles, for the index turned upon the center to the other angle, will give you the quantity of the angle you are at, but this exact planting at every angle is more tedious than the other, and therefore not ſo fit for wet weather. But now to protract this plot:

Firſt, by your ſcale, rule, and compaſſes, draw the line A B in length 3 chains 73 links, ending at the point B; then laying the center of my protractor upon the line A B, ſo as the center of it be upon the point A, and that end of the diameter from which the numbers are reckoned on the arch or limb towards B, make a point for the angle A at 89 degrees 10 minutes, by the direction whereof, and the point A, draw the line A E, which according to your ſcale, muſt be 2 chains 29 links.

In like manner placing the diameter upon A E, juſt as it was upon A B, and the center upon the point E, mark out by the limb, for the angle E, 129 degrees 20 minutes, by which draw the line E D, 6 chains 64 links.

In the next place, bring the center of the protractor to the point D, its diameter lying on the line E D, and its limb towards A, by which prick out 67 degrees 15 minutes for the angle at D, and draw the line 1 chain 88 links.

Laſtly, the center being at C, and the diameter upon the line D C, in ſuch manner as before at other angles, prick out by the limb or arch 137 degrees 30 minutes, and draw the line C B, for at B your plot ſhould cloſe; and if rightly done, the angle at B will be 116 degrees 30 minutes, and the ſide B C 4 chains 91 links, which you will find it to be by meaſure.

But if you plot by a line of chords, you are not bound to this order, but may go from A to B, and ſo round that way if you pleaſe, which you could not ſo well do with a protractor, without reckoning the numbers backward, yet it muſt be granted that a line of chords neither doth the work ſo quickly nor conveniently: this is the way.

When you have drawn the line A B of a proper length, ſet the compaſſes to the radius, and placing one foot of the compaſſes in the point B, and with the other deſcribe an arch of a competent length, beginning at that ſide of the line A B that is deſigned not to be the inward ſide, and upon this arch, 116 degrees 30 minutes muſt be ſet; but becauſe the line of chords gives only 90, ſet them firſt on from the line A B, and then take off the remainder 26 degrees 30 minutes, joining them to the 90 upon the arch, making a point, through which the line B muſt be drawn of a due length. In the like manner you muſt do at C E, but the angles at A and D need no ſuch piecing, being capable of being meaſured out by a line of chords at once.

Nor do your angles only give you trouble in this kind of work, but your lines alſo will be often found too ſhort to receive the touch of an arch upon the radius, eſpecially if the line of chords be large, and your ſcale little; and ſo it may often fall out when you uſe the protractor upon ſuch ſhort lines as A E and C D of this laſt figure: in which caſe a rule muſt be applied to them, and they muſt be extended to a due length, that the arches may meet them without the figure. And if thoſe extenſions of lines, and deſcribing of arches, ſpoil the beauty of your plot, the matter is not great, it is ſo eaſy to be retrieved; for if you lay on a clean paper, and prick through every angle, lines drawn between thoſe points, will give you the plot neat and perfect.

The artiſt ſometimes loſeth his labour of protraction through ſome error in the field, ſo that his plot will not cloſe; it is therefore proper to know, before you begin that work, whether it will or no; for which purpoſe if we take a number leſs by two than the number of angles in the plot, and thereby multiply 180, that product being found to be equal to all the angles, the plot will cloſe, this appears by our plot in the preſent work; the multiplier being 3, becauſe the angles are 5, and the multiplier muſt be two leſs than the number of angles.

	Deg. Min.
180	89 . 10
3	116 . 30
——	137 . 30
540	67 . 15
	129 . 35
	——
	540

This kind of trial is grounded upon two principles of Euclid and Ramus, mentioned in the beginning of this article, ſhewing that in all plain triangles, all the angles taken together are equal to two right angles, and that the ſides, conſequently the angle alſo, of every triangle figure, are more by two than the triangles of which it conſiſteth.

Concerning taking inacceſſible diſtances by the plain table, and acceſſible altitudes by the protractor.

Fig. 39. The ſubſtance of what is to be ſaid for the firſt of theſe, is gathered from the inſtructions given for plotting a field, by meaſuring only the ſtationary diſtance; but to make the caſe more plain to an ordinary capacity, ſuppoſe the line A C to be the unknown breadth of a river, over which a bridge of boats is to be laid, and the general, that he may inform himſelf what ſtore of boats and planks is neceſſary to be brought down, commands you to tell him the true diſtance from A, where he is at preſent, to C, a little boat-houſe on the other ſide the water.

To ſatiſfy his demand, plant your table covered with a paper at A, cauſing one to ſet up a mark at B, at a good diſtance from you, along the bank of the river, the farther the better, if diſtance do not hinder ſight: then having choſen a point to repreſent A, and laid the fiducial edge upon it, direct your ſights towards C and B, and ſtrike lines towards them. Which done, ſet up a mark at A, and from thence meaſure to B, 6 chains 32 links, and ſo plant your inſtrument at B, laying the fiducial edge to the line A B, and turning about the head of the inſtrument upon the ſtaff, till through the ſights you ſee the mark at A, and then ſcrew it faſt.

In the laſt place take 6 chains 32 links off your ſcale, and ſet it on the line A B, from A to B, and laying the fiducial edge to the point B, from thence direct the ſights to C, and draw the line B C, meeting or cutting the line A C in C: ſo ſhall the ſpace A C meaſured on the ſcales viz. 8 chains 29 links, be the diſtance deſired, and becauſe the chain is 22 yards long, if you multiply 8.29 by 22, the product is 182 yards and $\frac{38}{100}$ of a yard, which by reduction is ſome little more than 13 inches and $\frac{1}{2}$ of an inch.

Now, to take the height of a tree, tower, or ſteeple by a protractor, without any arithmetical operation, hang a plummet with a fine ſilk thread at the center of it, and hold it ſtedfaſtly with that end to your eye, where the numbers begin, then look ſtrait along the diameter, ſtill removing backward and forward as there is occaſion, till you ſee the top of the tree, tower, or ſteeple, and the thread at the ſame time fall upon 45 degrees, ſo ſhall the diſtance from your eye to the tree, tower, or ſteeple, meaſured in an horizontal or level line, together with the height of your eye above the bottom of it, be equal to the height of the object.

If either for convenience of ſight, or any other reaſon, you think proper to ſet the other end of the diameter to your eye, then the thread for the above trial muſt fall upon 135 deg. inſtead of 45.

Of casting up the content of land by a table.

Links	R.	P.
100000	4	00
90000	3	24
80000	3	08
70000	2	32
60000	2	16
50000	2	00
40000	1	24
30000	1	08
20000	0	32
10000	0	16
8750	0	14
8125	0	13
7500	0	12
6875	0	11
6250	0	10
5625	0	09
5000	0	08
4375	0	07
3750	0	06
3125	0	05
2500	0	04
1875	0	03
1250	0	02
625	0	01

This table consists of three columns, the first containing links, the second roods, or quarters of acres, the third perches; and the use of it is thus:

```
  7.25
  5.50
———————
 36250
 3625
 3625
———————
3.98750
```

Suppose a field to be 7 chains and 25 links long, and five chains 50 links broad, these by multiplication make 398750, whereof 5 figures being cut off towards the right hand, the figure 3 signifies acres, and the rest, viz. 98750 denote parts; and to reduce them into roods and perches, first substract from 98750 the greatest number of links in the table that can be substracted from it viz. 90000, and put down for it 3 roods 24 perches, which you find over against it in the annexed columns, and the remain being 8750, look in the table, and find over against it 14 perches, which by addition makes 3 roods 38 perches; so is the whole content of the field 3 acres, 3 roods, 38 perches.

```
A R P
—————
3 3 24
    14
—————
3 3 38
```

But note here, that if the remainder after the first substraction cannot be found in the table, you may take the nearest to it, so the error will be but part of a perch.

As for example.

7.35 being the half perpendicular, and 9.23 the base, give for their product 6.78405. The 6 signifies acres, and from the rest 70000 being subducted, to which 2 roods 32 perches answer, there resteth 8405; which, because you cannot find in the table, you must take the nearest, which is 8125, to which 13 perches answer; so the whole content of that triangular close, is 6 acres, 3 roods, and 5 square perches, and a little better.

```
A R P
6 2 32
    13
——————
6 3 05
```

SUSSINGLE, or *Surcingle*, the girt which comes over the saddle, and binds it firmly to the horse.

SWAMP, a hollow, watery place, in any part of a field; a bog. *See* BOG.

SWANG, a fresh piece of green sward lying in a bottom among arable or barren land.

SWARD, the surface of the ground.

SWARM, a large number of bees, seeking a proper settlement. *See the article* BEE.

SWATH, or *Swarth*, a line of grass, &c. cut down by the mower.

SWATH-BAUK, a swarth, or line of new mown grass or corn.

SWATH-RAKE, a rake about two yards long, with iron teeth, and a bearer in the middle, to which a man fixes himself with a belt, and when he has gathered as much as his rake will hold, he raises it and begins again. This instrument is in some counties called a dow-rake, and much used in Essex for gathering barley after mowing.

To SWEAL, to singe, or burn off the hair, &c.

SWILL, a vessel to wash in standing on three feet.

SWINE. *See the article* HOG.

SWINE-CRUE, a hog's-sty.

SWINE-HERD, a keeper of swine.

SWINHULL, a hog's-sty.

SYCAMORE, the name of a tree well known in many parts of England. It grows to a large size; the wood is soft and very white, and therefore valued by the turners; but is not esteemed very valuable for other purposes. However, as this tree will thrive better than most other sorts near the sea, it is frequently cultivated to screen plantations of other sorts of trees from the spray of the sea.

SYTHE. *See* SCYTHE.

T.

TABERN, a cellar.

TAGGE, a ſheep of the firſt year.

TAIL-SOAKED, a diſeaſe incident to cows, by which the joint of the tail near the rump, will, as it were, rot away. The cure is generally performed by cutting a deep gaſh into the part affected, then rubbing a handful of ſalt into the wound, and binding it up with a rag. Others mix ſoot and a clove of garlick with the ſalt.

TAN, the bark of oak, chopped and ground by a tanning mill into a coarſe powder, to be uſed in the tanning or dreſſing ſkins.

Tan is of great uſe in gardening: firſt, by its fermentation, when laid in a body, which is always moderate and of a long duration, which renders it of great ſervice to hot-beds: and, ſecondly, after it is well rotted, it becomes excellent manure for all ſorts of cold ſtiff land; upon which one load of tan is better than two of rotten dung, and will continue longer in the ground.

The uſe of tan for hot-beds has not been many years known in England; the firſt hot-beds of this ſort, which were made in England, were at Blackheath, in Kent, about fifty-five years ago: theſe were deſigned for raiſing of orange-trees; but, the uſe of theſe hot-beds being but little known at that time, they were made but by two or three perſons, who had learned the uſe of them in Holland and Flanders, where the gardeners ſeldom made any other hot-beds: but in England there were very few hot-beds made of tanner's bark, before the ananas were introduced into this country, which was in 1719, ſince which time the uſe of theſe hot-beds have been more general; and are now made in all thoſe gardens, where the ananas plants are cultivated, or where there are collections of tender exotic plants preſerved: and the gardeners here are now better ſkilled in making and managing of theſe hot-beds, than in moſt other countries; which might render it leſs neceſſary to give a full deſcription of them here: but, yet, as there may be ſome perſons in the remote parts of England, who have not had an opportunity of informing themſelves of the uſe of tanners bark for this purpoſe, I ſhall inſert the ſhorteſt and plaineſt method of making and managing theſe hot-beds, as they are practiſed by the moſt knowing perſons, who have long made uſe of theſe hot-beds: and, firſt, I ſhall begin with the choice of the tan.

The tanners in ſome parts of England do not grind the bark to reduce it into ſmall pieces, as is commonly practiſed by the tanners near London; where there is great difference in the ſize of the bark, ſome being ground much ſmaller than the other, according to the different purpoſes for which it is intended; but in many places the bark is only chopped into large pieces, which renders it very different for the uſe of hot-beds; for, if the tan is very coarſe, it will require a longer time to ferment, than the ſmall tan; but, when it begins to heat, it will require a much greater degree, and will retain the heat a much longer time than the ſmall; therefore, where there is choice, the middling-ſize tan ſhould be preferred; for it is very difficult to manage an hot-bed when made of the largeſt tan: the heat of which is often ſo great, as to ſcald the roots of plants, if the pots are fully plunged into the bed; and I have known this violent heat continue upwards of two months; ſo that it has been unſafe to plunge the pots more than half their depth into the tan, till near three months after the beds have been made: therefore, where the perſons, who have the care of theſe beds, do not diligently obſerve their working, they may in a ſhort time deſtroy the plants which are placed in the beds: on the other hand, if the tan is very ſmall, it will not retain the heat above a month, or five weeks; and will be rotten and unfit for an hot-bed in a ſhort time; ſo that, where the middle-ſized tan can be procured, it ſhould always be preferred to any other.

The tan ſhould be always ſuch as has been newly taken out of the pits; for if it lies long in the tanner's yard, before it is uſed, the beds ſeldom acquire a proper degree of heat; nor do they continue their heat long: ſo that when it has been more than a fortnight or three weeks out of the pit, it is not ſo good for uſe as that which is new. If the tan is very wet it will be proper to ſpread it abroad for two or three days to drain out the moiſture, eſpecially if it is in the autumn or winter ſeaſon; becauſe, then, as there will be little ſun to draw a warmth into the tan, the moiſture will prevent the fermentation, and the beds will remain cold: but, in the ſummer-ſeaſon, there is no great danger from the moiſture of the tan; the heat of the ſun through the glaſſes will be then ſo great, as ſoon to cauſe a fermentation in the tan.

Theſe tan-beds ſhould always be made in pits, having brick walls round them, and a brick pavement at the bottom, to prevent the earth from mixing with the tan; which will prevent the tan from heating; theſe pits muſt not be leſs than three feet deep, and ſix feet in width; the length muſt be in proportion to the number of plants they are to contain: but if they are not ten feet in length, they will not retain their heat long: for, where there is not a good body of tan, the out-ſide of the bed will ſoon loſe its heat; ſo that the plants which are there plunged will have no benefit of the heat; nor will the middle of theſe beds retain their heat long; ſo that they will not anſwer the purpoſe for which they are intended.

When the tan is put into the bed, it muſt not be beaten or trodden down too cloſe; for that will cauſe it to adhere, and form one ſolid lump; ſo that it will not acquire an heat; nor ſhould it be trodden down at the time when the pots are plunged into the beds; to avoid which there ſhould be a board laid croſs the bed, which ſhould be ſupported at each end to prevent its reſting on the tan; upon which the perſon ſhould ſtand, who plunges the pots; ſo that the tan will not be preſſed down too cloſe. When the tan is quite freſh, and has not been out of the pits long enough to acquire an heat, then the beds will require a fortnight or three weeks time, or ſometimes a month, before they will be of a proper temperature of warmth to receive the plants: but, in order to judge of this, there ſhould be three or four ſticks thruſt down into the tan, about eighteen inches deep, in different parts of the bed; ſo that by drawing out the ſticks, and feeling them at different depths, it will be eaſy to judge of the temper of the beds; and it will be proper to let a few of theſe ſticks remain in the bed, after the plants are plunged, in order to know the

the warmth of the tan; which may be better judged of by feeling these sticks, than by drawing out the pots, or plunging the hand in the tan.

When the tan is good, one of these beds will retain a proper degree of heat for near three months; and when the heat declines, if the tan is forked up, and turned over, and some new tan added to it, the heat will renew again, and will continue two months longer: so that by turning over the tan, and adding some new tan every two months, or thereabout, as the bed is found to decline of its heat, they may be continued one year: but every autumn it will be proper to take out a good quantity of the old tan, and to add as much new to the bed, that the heat of the bed may be kept up in winter; for, if the heat is suffered to decline too much during the cold season, the plants will suffer greatly: to prevent this, there should always be some new tan added to the bed in winter, when the heat is found to decline; but the tan should be laid in a dry place, a week or ten days, to dry, before it is put into the bed; otherwise the moisture will chill the old tan in the bed, and prevent the fermentation: so that unless the tan is turned over again, there will be little or no heat in the beds: which often proves fatal to the plants which are plunged into them: therefore, whoever has the management of these beds, should be very careful to observe constantly the warmth of the tan; since, upon keeping the beds in a due temperature of warmth, the whole success depends; and, where this caution is not taken, it frequently happens, that the ananas plants run into fruit very small, or the plants are infested by insects; both which are occasioned by the growth of the plants being stopped by the decline of the heat of the tan; therefore great regard must be had to that, especially in winter.

The great advantages which these tan-beds have of those which are made of horse-dung, are, the moderate heat which they acquire; for their heat is never so violent as those of horse dung; and they continue this heat much longer; and, when the heat declines, it may be renewed, by turning the beds over, and mixing some new tan with the old, which cannot be so well done with horse-dung; and likewise the beds will not produce so great steams, which are often injurious to tender plants; so that these tan-beds are much preferable to those of horse-dung for most purposes. *Miller's Gard. Dict.*

Tan, when it is well rotted, is also an excellet manure for all cold and stiff lands: and if it is laid upon grass-ground in autumn, that the rains in winter may wash it into the ground, it will greatly improve the grass; but when it is used new, or in the spring of the year, when dry weather comes, it is apt to cause the grass to burn; which has occasioned the disuse of tan in many places; but, if properly used, it will be found an excellent dressing for all stiff lands. *See the article* BARK.

TANSEY, the name of a plant often cultivated in kitchen gardens, and of which there are three varieties, that have all been produced accidentally from the seeds of the common tansey. All the varieties are easily propagated by the creeping roots, which, if allowed to remain undisturbed, will overspread the ground where they are permitted to grow; so that wherever tansey is planted in a garden, the slips should be placed two feet asunder, and in particular beds, where the paths round them may be often dug, to keep their roots within bounds. They may be transplanted either in spring or autumn, and will thrive in almost any soil or situation.

Wild TANSEY. *See the article* SILVER-WEED.

TARES. *See the article* VETCHES.

TEAM, a number of horses or oxen drawing at once the same carriage.

To TEAM, to pour or lade out of one vessel into another.

TEAZLE, or *Fuller's Thistle*, a species of the thistle cultivated for the use of clothiers, who dress their cloth with them.

The teazle is propagated by sowing the seeds in March, upon a dry soil. About one peck of the seed will sow an acre; for the plants should have room to grow; otherwise the heads will not be so large, nor in so great quantity. When the plants are come up, you must hoe them in the same manner as is practised for turneps, cutting down all the weeds, and singling out the plants to about six or eight inches distance; and as the plants advance, and the weeds grow again, you must hoe them a second time, cutting out the plants to a wider distance; for they should be, at last, left at least a foot asunder; and you should be particularly careful to clear them from weeds, especially the first summer; for when the plants have spread so as to cover the surface of the ground, the weeds will not so readily grow between them. The second year after sowing, the plants will shoot up heads, which will be fit to cut about the beginning of August; at which time they should be cut and tied up in bunches, setting them in the sun, if the weather be fair; but if not, they must be set in rooms, to dry. The common produce is about an hundred and sixty bundles, or staves, upon an acre, and they will sell for about one shilling a stave. *Miller's Gard. Dict.*

M. de Chateauvieux extended the new husbandry even to the culture of the teazle, or fuller's thistle, which grew to a surprizing height, and produced an extraordinary number of the finest and best heads that the fullers in his country had ever seen.

" I am well informed, says an ingenious correspondent of the editors of the Museum Rusticum, that the principal place in the kingdom for the cultivation of the teazle, is about Wrington in Somersetshire, many of the inhabitants of that, and the neighbouring parishes, being chiefly employed therein; and from these places the cloth manufactories in the counties of Gloucester, Somerset, and Wilts, are supplied, and even a great many packs carried annually into Yorkshire.

" The land most suitable for this plant is that of a thin, sweet surface, and marly bottom, though a clay or stone-trash bottom will do, and produce large crops: rich loam, or strong clay, is very improper, as on them the plant is apt to grow luxuriant, and thereby cause the heads to be large and coarse-hooked, and, in a moist summer, subject to mildew and rot before they blossom and are fit to cut.

" As to situation, a southern aspect, on the decline of a hill, is to be preferred, though any other will do; but upland ground is to be most esteemed, more especially in an enclosed country, that the wind may assist in carrying off the natural humidity of the plant in moist seasons, which sometimes, in low and small enclosures, is retained so long as to cause the heads to taint, and become rotten.

" Having made choice of a piece of ground, (an old lay is preferable) in February cause it to be ploughed in ridges of three bouts each, at a depth suitable for a crop of beans, taking care that the furrows be laid strait, and as even as may be; the middle of the ridge highest, and a flesh furrow ploughed in the furrow between each ridge; after which let a man go along each ridge, and with a mattock, hoe, or spade, raise earth in small clods, at suitable distances from each other, to produce earth, when meliorated, to heal or cover the seed.

" Having done thus much, let it remain as it is until the time for sowing the seed, which will be about a week or ten days in April, as then the earth is generally moistened with rain.

" At this time cause a middle-sized harrow to be drawn over the land once or twice in a place, to fill the crevices between each furrow, and level the surface; after which sow the seed broad-cast, in the proportion of two bushels on an acre; then harrow it in, the same as turnep seed, and let it remain until the plants are come up, and grown into six or eight leaves each; when some person or persons should go over the field with a hoe, and cut out the plants, where they are too thick, to the size of about two feet from each other every way, if the ground be in heart; if it be thin poor land, sixteen or eighteen inches distance is sufficient.

" After this they may remain until the latter end of August, when they must be gone over as before, with this difference, the person should have a spade made about four inches broad, and eighteen inches long in the bit, or pan, with a tree in it of three feet six inches long: with this tool the workman must go backward, and turn the whole surface over, about two inches deep, in long spits, turning the spade from the plant, to turn the spit so as no earth may fall into the heart of the plant: but it would be adviſeable, at the time of firſt ſizing the plants, to leave more than are neceſſary to ſtock the ground, to have ſome to fill up the vacancies where any may happen to die, which is often the caſe during the ſucceeding winter, and more eſpecially ſhould it prove froſty.

" Having done thus much, in this ſtate they are to remain during the winter; only care muſt be taken that no cattle get into the field, eſpecially ſheep, which will eat out the cabbage of the plant, and ſpoil it.

" About the latter end of the ſucceeding February, the plants ſhould be digged between as in Auguſt, being very careful that none of the earth falls into the middle of them; and in May, when the plants begin to ſhoot into ſpindle, the ground muſt be digged over again, with this difference, inſtead of being laid plain, it muſt be raiſed into ſmall hillocks about each plant, to ſtrengthen them in the ground, ſo that the wind may not blow them down when loaded with heads.

" This being done, they are left till the ſeaſon for cutting, which will be a work of ſome time, as the heads become fit, which is known by their blowing: it is to be obſerved that the bloſſom firſt appears near the bottom of the head in ſmall, pale, blue flowers; and when theſe appear to have blown ſomewhat more than half way up, ſuch head is fit for cutting, which is generally done in this manner; a man has a knife, the blade about two inches long, with a ſtring in the haft to put over the hand, and a pair of ſtrong gloves to defend him againſt the ſharp prickles on the ſtalks.

" Being thus equipped, he muſt go along each furrow, and cut with one hand, putting them into the other, till he has as many as he can eaſily gripe; when cutting one which is a little more ripe than the others, and the ſtem about eighteen inches long, he binds the handful together with it, (the others are generally cut about nine inches long) which done, the handful is toſſed to ſome open ſpot, in order to be carried to the place for drying, which is done in the following manner.

" Some ſmall poles of aſh, willow, or any ſtrait-growing wood, about the ſize of [illegible]ge-ſtake, and ten or twelve foot long, muſt be pro[illegible] at the great end of which, about eighteen inches [illegible] it, a hole muſt be made, and a peg put through, to extend three or four inches on each ſide. The poles thus prepared, the handfuls of teazels muſt be put on them, by running the ſmall end through the handful, until the pole be filled: in this condition they muſt be ſet on one end to dry; but it is to be obſerved, that they ſhould be carefully carried into a houſe or ſhed every night, and brought out at days; and in the houſe ſet ſo as for the poles not to touch each other, leſt they taint, which, for want of a free circulation of air, they are very ſubject to, and more ſo, if it be cloſe moiſt weather.

" When they are dry, ſo as to be free from moiſture, they may be carried into ſome upper room, and placed up cloſe together: over a cow-houſe, or place where cattle are fed in winter, is to be preferred, becauſe their breath is ſuppoſed to help to brighten them in colour; wherefore they are the better eſteemed, and ſuppoſed to be more tough in hook than otherways they would.

" When they have by this means acquired from the gradual moiſture of the air an additional elaſticity to the hooks, and are brightened in colour, which will be completed a little after Chriſtmas; the time that generally the heads are ſorted, and made out in the following manner. The handfuls are brought from the ſtorehouſe into ſome large room, uſually a barn-floor, where they are untied one at a time; and generally made four ſorts of. The largeſt heads which are found, and are ſuch as grow on the middle ſtem of each branch, are thrown for the firſt ſort, and called kings. The next ſmalleſt which are found, and are commonly ſuch as grow as ſide heads on each branch, are thrown for a ſecond ſort, and are called middlings. Another, or third ſort, are ſuch of the largeſt, or thoſe which grew on the middle ſtem, as are damaged by the mildew, wet, or other accident; and which would have been kings, had not ſuch defect rendered them unworthy that appellation. Theſe therefore are thrown to a third ſort, and denominated ſcrubs. The laſt, or fourth ſort, is the refuſe of all, and are ſuch as are too ſmall, or too much damaged for any uſe; and are therefore thrown away.

" When a quantity is thus ſeparated, they are made out in the following manner: the perſons who do it, put of the kings ten in each handful. Firſt, ſix of the larger, in the manner of a fan extended: and four leſſer of the ſame ſort, in the boſoms of the ſix; and then bind their ſtems together with a ſpleet of willow, or ſome tough wood, by wrapping it about them three or four times, and tucking the end under. When the kings are tied up in handfuls in this manner, a ſtraight ſtick of about three-fourths of an inch diameter, and two feet ſix inches long, is ſplit to within four inches of one end. Twenty-five of theſe handfuls are put on this ſtick, alternately head to ſtem; letting two of the middle ſtems of each handful be in the cleft, to hold them ſecure: then a ſmall wreath, made of ſpleet, is ſlipped on the upper end of the ſtaff, which holds it together, and keeps the whole from falling about. In like manner are the ſcrubs, or third ſort, alſo made out and put in ſtaves. But of the middlings, or ſecond ſort, double the number of heads are put in one handful, by making two fan-like rows of ſix each, and four in their boſoms on each ſide; and theſe are put into ſtaves of three feet long each, ſpilt as the former, and thirty handfuls in each ſtaff. When they are thus made out, they are fit for ſale, and are to be laid by for that purpoſe in ſome convenient place, where they may not be bruiſed. Thirty ſtaves of the firſt and third ſort are accounted a pack; and forty ſtaves of middlings make alſo a pack.

" An acre of land, if well grown, and what is deemed a full crop, often produces nine packs of kings, nineteen of middlings, and two of ſcrubs. The common price per pack of the firſt ſort, is twenty, the ſecond ſort fourteen, and the third ſort eight ſhillings. But in a French war, they are generally double theſe prices.

The expences attending a crop per acre are,

	l.	s.	d.
1ſt, Rent of the ground for the crop, which is one year and a half	5	0	0
2d, Ploughing and ſowing	0	15	0
3d, Firſt dreſſing or delving	1	0	0
4th, Second delving	0	10	0
5th, Hilling	0	15	0
6th, Cutting and carrying home	1	15	0
7th, Tythe	0	5	0
8th, Clearing off the ſtalks, and binding them in bundles	0	5	0
9th, Making out, at two ſhillings per pack, ſpleets, ſtaves, and wreaths included	3	0	0
All which make the total expence, attending one acre of teaſels	13	5	0

" This, excluſive of ſeed, which is not often bought, becauſe enough may be ſaved in making out the crop in winter: but if the ſeed be bought, it is generally valued equally with wheat. Therefore, if two buſhels be ſown on the acre, ten ſhillings may be added as the medium price; which makes the whole expence of one acre thirteen pounds fifteen ſhillings, if it ſhould produce thirty packs. But ſuch produce is not always the caſe, for twenty is to be eſteemed a middling crop.

" With reſpect to crops of corn, raiſed amongſt the plants, it is practiſed in many places; and indeed it has been mine to plant field beans, or garden beans, at about three feet diſtance ſingly from each other, in a promiſcuous manner over the teaſel land: which crop of beans, by the cultivation neceſſary for the teaſel, is greatly forwarded in growth, and often produces from four to five and ſix ſtalks from one bean, well loaded with cods. This crop is no injury to the teaſel crop the firſt year, and frequently pays the expence of labour attending the whole.

" The crop, which generally ſucceeds the teaſel, is wheat. The ground, by being frequently delved and kept clean, during the teaſel crop, becomes very fit for this grain, and generally produces very large crops. Forty buſhels per acre is not uncommon, though the land in itſelf is often ſuch as is not annually worth more than ten ſhillings per acre. Hence, I think, it is evident, that a crop which well ſhades the ground, (in ſummer) and that has been two or three times turned and cleaned from all weeds, before such shading, greatly fertilizes the land on which it grows. But I have frequently observed an error, to which the occupiers of such land are too liable after these fertilising crops. This error is the ploughing away (by over cropping) the profits that would ensue. If after its being thus fertilized by the crops of teasels, it were to be laid down with suitable artificial grass-seed, sown amongst wheat, and properly managed afterwards, it would, I am experimentally sensible, be a lasting improvement." *Museum Rusticum, vol.* III. *pag.* 237, *and vol.* VI. *pag.* 1.

To TED, to spread abroad new mown grass, which is the first thing done in order to its being dried, and made into hay.

TEDDER, *or* TETHER, a rope with which a horse is tied in the field, that he may not pasture too wide.

To TEEM, to be pregnant; to engender young.

TENDRIL, the clasper of a vine, or other climbing plant.

TENEMENT, any thing, as a house, &c. held by a tenant.

TENURE, the manner in which tenants hold their lands, &c. of their lord.

TERRAGON, the name of a spicy plant, often cultivated in kitchen-gardens.

It is propagated by seeds, slips, or cuttings. March or April is the proper time for setting them, and they may be transplanted again in the summer. The plants should stand at least a foot asunder every way, and they should be kept clean from weeds. They will endure great cold; and even extraordinary drought will not hurt them, if they are but a little watered, or if the earth about them is kept loose and well stirred. A very few of their leaves mixed with a sallet, particularly of lettuces, give it a high aromatic flavour. The tenderest and freshest are the best for this purpose.

THATCH, straw laid on the top of a building, rick, &c. to keep out the weather.

THEAVE, *or* THIEF, an ewe of the first year.

THETCHES. *See the article* VETCHES.

THICKET, a close knot, or tuft of trees; a close wood.

THILL-HORSE, *or* THILLER, the last horse in a team; the horse that goes between the thills or shafts.

THISTLE, a well known prickly weed growing in corn-fields.

Where-ever thistles grow naturally, it is a sure sign that the land is strong: but they are, at the same time, a great annoyance to every plant intended to be cultivated. The best way to destroy thistles is to cut them up by the roots before their seeding time, which is in the autumn; for cutting of them too young, will only make them branch the more: or, which Mr. Lisle prefers, to pluck the thistles up by hand, when the ground is reasonably moist, before they are grown to the size at which they are usually cut. They may then be easily drawn up with their roots, by the thumb and two fingers; and the weeder may guard against their prickles by putting on a glove, or false fingers, made of hard leather. Chalking of land is a good way to destroy this very noxious growth: but thorough tillage, summer fallows, and repeated good harrowings, are the most effectual of all.

By an excellent regulation in France, a farmer may sue his neighbour who neglects to thistle his land at the proper seasons, or may employ people to do it at the other's expence. And it were to be wished, that a similar law was enacted here, to prevent the wide-spreading mischiefs occasioned by the seeding of this pernicious weed; among which may be reckoned, besides its choaking the young corn, that if wheat, in particular, be not well thistled, the reapers take up the grips so tenderly, lest they should prick themselves, that, by their loose handling of them, they sometimes leave upon the ground corn enough to sow the whole field.

THISTLING, the action of cutting or pulling up thistles, in order to destroy them.

THRESHING, the action of beating out the corn.

Though the flail be the best instrument yet known for threshing of corn, because it separates the grain from the straw and husks very effectually and expeditiously; yet, as it always bruises a great many seeds, even so as to render them incapable of growing, it were much to be wished that some method could be found, by which this essential inconvenience might be avoided. Some engine or other, provided with a number of flails, or other pieces answering the same end, might surely be made to move by water, wind, or a horse, so as to perform the business of threshing still cheaper and more expeditiously, and with less damage to the health of the husbandman, which is frequently thought to be injured by the dust, &c. which arises in the common way of threshing, as well as by the very great laboriousness of the work. This well deserves the attention and endeavours of skilful mechanics. At all events, the thresher ought not to wear thick iron-clouted shoes whilst he is at work, especially if he is to thresh new corn, and particularly wheat; because they will be apt to bruise it. His shoes for this business should be soled with an old hat, or some other soft substance.

Mr. Mortimer esteems it a day's labour for a man to thresh four bushels of wheat or rye, six bushels of barley, five bushels of oats, or five bushels of beans and peas, if the corn thresh well. But Mr. Lisle says a good thresher assured him that twelve bushels of oats or barley are reckoned a good day's threshing; that this very man had threshed fourteen bushels of oats daily, and winnowed them, for several days together; but that those oats yielded indeed extraordinary well: that five or six bushels of wheat are a very good day's threshing; and if the corn be clung, and yields ill, sometimes three bushels are as much as can be threshed in a day. He rates the common price of threshing at eight-pence for a quarter of corn; and observes, which may account for the difference between his estimate and Mr. Mortimer's, that six bushels of wheat of the growth of a warm gravelly vale are as easily threshed in a day, as four bushels of the produce of cold hilly land; because the stroke of the flail must be forced down stronger to beat out the grain of this last, than it need to be for the former: and also, that as the straw of corn of the growth of a light soil is shorter than that of a strong clayey ground, more sheaves, and consequently more ears of this first sort may be laid together on a floor of equal extent, than can be of the last, whose longer straw requires proportionably more room.

The worse wheat is, though it be never so dry, the rougher it will feel when handled; because thin and coarse wheat is not so plump and globular as fine wheat, but is apt to be pitted and wrinkled, which of course renders it less slippery. It will handle cooler out of a stack two years old, than it will out of one that is only a year old: for in that time the mists and rimes, especially in a hilly country, will be driven into the stack.

Mr. Lisle, who makes this remark, adds, from his own experience, that wheat threshed in damp weather generally yields but little flour, with a great deal of bran, when it is ground; and that if it be put into sacks, it will grow musty in less than three weeks, let the weather be ever so dry afterwards: but if it be threshed when the air is perfectly clear and dry, it will keep well in sacks, for a long time; especially if these are laid upon trestles high enough to secure them from the dampness of the ground or floor.

For the keeping of meal, in general, there is no better way than first to bolt it, and clear it from the bran, which is very apt to corrode and putrify it, and make it musty; then to tread it down as hard as possible, and head it up closely, in clean, dry, tight, and well bound casks, which must be laid in a cool dry place.

The beards of barley come off best, in threshing, when the swarths of this corn have taken the dew before their being housed. It will keep well in the mow, unthreshed, for one year; and for making it into malt, which must be done before the heat of the summer comes on, it should not be kept above a year and a half, or at most two years: otherwise it will be filled with weevils; unless it has been previously cured in a stove or kiln.

Oats, being defended with a double husk, are the grain least subject to harbour vermin. The best way to keep them after they are threshed, is to dry them well on a kiln, and then to barrel them up in clean close casks: but they should not be threshed earlier than Christmas, because they are not fit for keeping before that time.

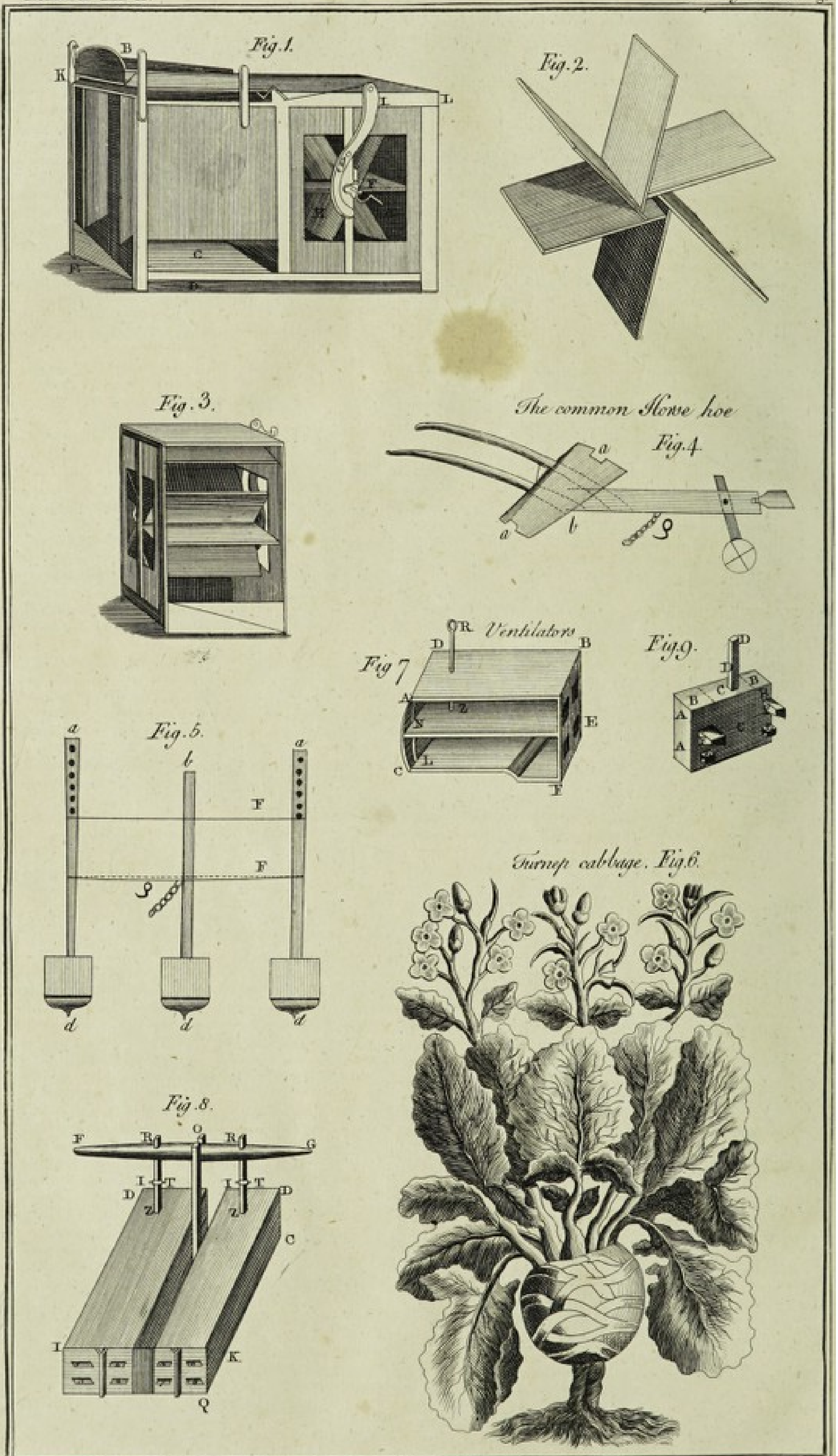
Fig.1.
Fig.2.
Fig.3.
The common Horse hoe
Fig.4.
Ventilators
Fig 7
Fig.9.
Fig.5.
Turnip cabbage. Fig.6.
Fig.8.

Beans and peas always thresh best after they have sweated in the mow, which they are very apt to do, because, as the whole crop of either of them never ripens all together, the green parts heat, and communicate their ferment to the whole heap. The danger to be guarded against here is, that the ripe so heated do not give fire to the green, by which both might be either rotted or consumed; to which the bigness of their leaves, and hardness of their stalks, which continue moist and sappy a long time, will also contribute very much. For this reason farmers generally choose to stack them without doors, rather than to house them; that they may be the more thoroughly dried by the sun and air. But the best way of all is to kiln-dry them, or dry them well in the sun; after which they will keep many years, without turning or any other care, though they be laid ever so thick in the granary. As beans are a very large seed, and consequently full of moisture, it is found best to let those that are intended for keeping sweat in the mow till March, when they may be threshed without danger: for beans never give again, after they have once been thoroughly dried.

Peas are, of all grain, the most subject to rottenness and imperfection, because they are the most apt to breed worms, weevils and mites, by reason of the lusciousness and sweetness of their grain. The better they are dried, either in the kiln or sun, the former of which will generally be found most effectual in this country, the longer they will keep sound, and the fitter they will be for the food of cattle, by helping to make them thirsty; it being a just observation, that if cattle drink well, they will feed well. What is intended for the food of men should not be dried too much; because that would make the peas require double the time in boiling: nor need they be threshed for this use, but as they are wanted; or else they may be put into close casks, and headed up. In granaries, they keep best in thick heaps, or in bins; spreading of them thin upon the floor being apt to dry them too soon, and to take from them much of their sweetness and goodness.

Vetches wanted for sowing immediately after they are cut, may be threshed very well on a hurdle, with a cloth; though they may then be too soft, notwithstanding their being ripe, to be threshed on a floor, where the flail, and the thresher's feet, would bruise and break them.

When a careful husbandman opens and spreads his sheaves, he will pick out of them at least all the largest and most apparent weeds, before he begins to thresh. As he proceeds in his work, he will, from time to time, remove all the long straw from the corn beaten out of it, which last always lies underneath, with a prong or fork; and then the pieces of straw, broken ears, &c. with a wooden rake. He will then shovel the remaining grain up on one side of the floor, and repeat this till he has threshed out enough to make what is commonly called a clearing.

This heap is then passed through a wide sieve, which retains only the bits of straw, and such fragments or ends of the ears as have escaped the flail. These frequently contain very good corn; though the farmer seldom grudges giving them to his poultry, or binding them up with straw intended for fodder. A few of them inclosed in a small truss bound at both ends, the better to keep them in, will entice horses to eat heartily of this straw, which affords them good nourishment: and M. Duhamel judges that they would also be excellent and profitable winter-food for sheep, when there is a scarcity of grass.

A great deal of labour may be saved in the using of this sieve, by fastening a loop to its rim, and resting it thereby on a hook suspended by a rope. This will sustain half the weight of the corn, and the winnower may easily give it the necessary circular motion. But a yet more convenient method, is to place a square sieve, of wire is best, with thin boards for its sides, upon two polished rods of iron, to throw the corn up into it with a shovel, and to push it backward and forward upon these rods, on which it moves easily, and will sift a great deal of corn in a short time.

For separating the chaff, which is the next business, the casting-shovel is much more expeditious than either the wicker fan, or the common winnow with sails. When this shovel is used, the wind must blow through the barn, either in at one door and out at the other, or in at a window, and out at the opposite door. The winnower then, placing himself under the wind, and close to the heap of corn that is to be cleansed, takes it up, one shovelful after another, and, with a circular motion, throws it scattered in the air, against the wind, towards the opposite side of the barn. The best grains, which are the heaviest, go farthest; the lesser fall short of them; and the very small, shrivelled, and much damaged, with the seeds of cockle, darnel, and several other weeds, fall still nearer to the man who throws them; while the lighter seeds of other weeds, with the bits of straw, chaff, dust, &c. are blown from all the rest, by the wind. From time to time, the winnower quits his shovel, and sweeps away the second sized corn, which would be too much intermixed with the smallest, if the heap was left alone and suffered to accumulate till the end of the winnowing; and when the whole is done, he shovels up the finest grain. The least of all, which borders on the chaff, &c. is also then collected, and the three sorts, after being sifted or screened, to cleanse them from any remaining dust, are laid up separately; the first for sale, the next for domestic uses, and the third, if the farmer can afford it, chiefly for the food of poultry. The short straws and chaff are sifted in a pretty fine sieve, to clear them likewise of dust, and are frequently given to oxen and cows.

Mr. Lisle observes that the seeds cannot be separated from any grain by the common fan, but that it may be done with the screen; of which he therefore advises the constant use for all sorts of corn designed for sowing.

Though wind is, in all cases, the chief agent in the cleansing of seeds, which being intrinsically heavier than their coats or husks, are, by the same force applied to both, carried to different distances, in proportion to their weight, and thereby consequently separated; yet the natural action of this assistant is liable to many inconveniences: it blows not constantly; but frequently disappoints the winnower in his time of greatest need: when it does blow, it is not always in the best direction to answer the situation of his barn; and without doors it is intirely useless to his purpose, if it be not attended with fair weather. Besides, when its force can be applied in the best way, it is even then not equal; but generally acts by sudden blasts, which, as is well known, disorders the whole work, and occasions a considerable waste of seed.

The Dutch avoid these inconveniencies by using a machine (Plate XXVI. Fig. 1.) which creates an artificial wind, uniform and steady in its action, and always ready at command.

The fan, (Fig. 2.) which is the acting part of this engine, produces a wind proportioned to the velocity with which it is turned on its axis, and therefore capable of several degrees of strength, as best suits the purpose of the winnower.

This fan is inclosed in a large case or box, K L, and occupies one half of it; which is represented separately, and in a different view, in Fig. 3. It is suspended freely on its axis, and turned by the handle A. The other half of the box is empty, and receives the seed as it falls down from the hopper B, to the sloping floor visible at C, along which it slides out at D, while the force of the wind which is confined within this winnow, and always acts in the same direction, viz. lengthways of the machine from A to E, carries the chaff, light and rotten grains, dirt, &c. out at E. In this passage, the wind meets the seed constantly falling from the hopper, and impels it more or less toward the end E, according to its weight. Good seed never goes quite so far, but comes down within the box.

The hopper here is ingeniously contrived to save labour. It hangs by strings upon four pegs, and moves with such ease, that the necessary motion may be communicated to it by the same hand that moves the fan, without any hinderance to the workman. To this purpose, a triangular board *f*, is fixed upon the handle of the fan, and turns with it. The angles of this board, in their rotation, press against the lower end of a little lath, incurvated as in the figure, which moves freely upon a peg at *g*. This end accordingly recedes from the pressure towards H, and consequently the upper end moves the contrary way, towards I, and by a string fastened from it to the hopper, draws this last after it, out of its natural situation. When this pressure ends, and the sides of the little triangle are next

next to the lath, the hopper hangs freely, returns to its former place, and takes the lath along with it, till the next angle of the little triangle begins to act; and so alternately as long as the fan moves. As the hopper is thus in continual motion, the seed sheds down, and is winnowed as it falls.

The next care is to cleanse the corn from all foreign bodies, which could not be carried off by the wind, such as stones, bits of earth, &c. These are separated by running the grain through a sieve wide enough to let it pass with ease, while bodies of a larger bulk are retained: and it is likewise often necessary afterwards to use a fine sieve, which lets through only the dust, seeds of weeds, and other bodies smaller than the corn.

As the farmers in many places feed their cattle, and particularly their sheep, in the winter, with half-threshed straw; and as new straw is good food for horses, which are induced to eat it very readily when it still contains some grain; there is, in this respect, an advantage in threshing the corn only by degrees; besides, that the grain itself is allowed to improve in its quality when preserved in the ear, so as to attain the most perfect maturity, to sweat out its moisture, and to acquire a degree of hardness which fits it for long keeping. About three months after it has been cut, is generally reckoned the best time for threshing wheat that is intended for keeping; and accordingly our prudent husbandmen make this the business of winter, when their presence is least wanted in the field. But, on the other hand, seed wheat cannot well be too soon cleared from the chaff, as M. de Chateauvieux's experiments have proved; and the best way of doing this, is by striking the ears against a beam. By this method the husbandman will obtain fine, long, unbruised straw, fit for binding up his next year's sheaves, for thatching, and for various other useful purposes. Of this he should always save, and stack, as much as he can spare, when it proves long and good; for wheat straw will keep perfectly well a year or two; and if there be no occasion for it in that time, it will make litter and dung at last. Barley-straw is likewise very serviceable for thatching, or to throw over stacks of barley, or peas, till they can be thatched: but oat-straw is of no great use, unless it be to cover an oat-rick, peas for fatting hogs, or corn for fowls. In general, an empty space should be left in the barn, if it can be done conveniently in harvest time, to receive the litter, and foddering straw, that is threshed out before cattle come to fodder; or it should be laid under some cover, for otherwise it will rot.

THRASHING-FLOOR, the floor on which the corn is thrashed. *See the article* BARN.

THRAVE, a shock of corn consisting of twenty-four sheaves.

THREAF, a handful, a bundle, a pottle.

THROATING, the action of mowing beans against their bending, which is never done but in a thin crop.

THROATWORT, the name of a perennial weed common in pasture grounds. The stalk is cornered and undivided. The flowers grow in bunches at the top of the stalk. They are erect, of a beautiful purple colour, and divided in the middle into five acute segments.

THYME, a well known aromatic plant propagated in kitchen gardens.

Botanists enumerate nine different species of thyme, besides several varieties; but they are all propagated either by seeds or parting the roots.

The most useful sort, either for culinary purposes, or for medicine, is the broad leaved thyme, most commonly cultivated in the kitchen-garden; for the narrow leaved kind never grow so large. Their culture is, however, exactly the same.

The seeds of thyme, if it be raised from thence, should be sown either in March or October, but the former of these months is best, in a well dug bed of light earth; taking care, as they are very small, not to drop them too close together, nor to bury them deep, for this last would make them rot. When the plants are come up, they should be carefully over looked and cleared from weeds, and if the season be dry, their growth will be greatly promoted by watering them twice a week, for some time. In June, if it be a spring sowing, the plants should be thinned to the distance of six inches asunder every way, that they may have room to spread: and those which are drawn out may be set in other beds, at the same distance from each other. They must be watered till they have taken root, and will then require no farther care, except weeding them, till the winter, when they may be pulled up, and laid by in a dry place, for use. The autumnal sowing should be thinned as before, early the next spring, if it be let stand till then; for there will be little danger of its resisting the severest winter of this country, especially if the plants grow on a dry, poor, and stony land. In rich ground, indeed, where they grow luxuriantly, they are sometimes destroyed by severe frosts. Thyme will even flourish upon a stone wall.

If the plants are propagated by parting their roots, this should also be done in March or October. The old plants should be taken up, their roots should be slipt into as many parts as can be, and these slips should be set six or eight inches asunder every way, in beds of fresh light earth. If the season is dry, they must be watered there till they have taken root; and with only weeding of them afterwards, they will soon be fit for use.

To save the seeds of thyme, some of the plants should be left unremoved till the next spring. They will then flower in June, and their seeds will ripen in July. These must be pulled up and beaten out as soon as they are ripe; for the first shower of rain would otherwise wash them all out of their husks.

Thyme is so great an impoverisher of the earth, that no crop will thrive well where that stood the year before, unless the ground be trenched deeper than the thyme rooted, and at the same time enriched with dung, or some other suitable manure.

TICHING, setting up turfs in such a manner as they may be dried by the sun, and fit for being burnt for their ashes upon the land.

TIKE, an insect found in dogs, sheep, cows, &c.

TILLABLE, arable, fit for the plough.

TILLAGE, the act or practice of tilling, or cultivating land. *See the article* PLOUGHING.

" I was much pleased, says a correspondent of the editors of the Museum Rusticum, with an account which I received about six weeks ago, of a peculiar management of tillage at Market-Weighton, in the east-riding of Yorkshire, given to me by a sensible man of veracity, who was born and bred a farmer in that neighbourhood.

" The inhabitants of Market-Weighton have it seems five fields, two of a sandy soil, and three of a strong clayey soil; the former, as will easily be conjectured, destined to rye, and the others to wheat. Their sandy lands are disposed in four swathes breadth; and finding by experience that considerable parts of each land, towards each furrow, are starved by the coldness of the water dripping from the higher parts of the lands, they have for many years altered their former method: and only ploughed the half of each land, viz. the two middle swathes: so that they have now excellent rye growing on the higher and dryer half of every land, and excellent meadow growing on the lower and wetter half, which being just two swathes, is mowed with great ease and exactness.

" It will, perhaps, be thought by some, that by making narrower lands, they might have more dry land, and consequently more corn. But I apprehend, these industrious husbandmen find by experience, that when they make their lands narrower, and consequently with less descent, the water stagnates in the higher parts, and consequently spoils their whole crop. Nor could they, I suppose, sow more corn on their lands, in their present disposition, with convenience, as their present method allows them just one swathe on each side.

" They have rye and meadow in one of their two sandy fields every other year, and a fallow the next year. The having half of the field in grass, affords good grass for their sheep, &c. in that year; and allows them to keep a good stock thereon; and this stock, in return, manures the ground considerably, both the fallow and the swarth. One of their wheat-fields affords them plenty of worse or spring corn; and thus they are supplied with wheat, rye, spring corn, meadow, and summer grass, from their five fields, which in any other management they could scarcely be.

" It is observable also, that by this management they only plough as much as four fields, and consequently can afford

afford one fifth more ploughing to every piece of ground in tillage, than they otherwise could, on supposition that their fields are all of the same extent.

" These provident people, gentlemen, have another piece of management well worthy the attention of others. They have two great fairs for sheep; one in spring, and the other in autumn. They hold the former of these fairs in one of their fallow fields, which is to be ploughed up in spring. The concourse of sheep, horses, &c. manures this field surprisingly, and then they turn in the dung before it be evaporated or baked. Their later fair is held on the other fallow field, which is soon to be sown with hard corn. And here they receive equal benefit.

" Whether they have their spring fair on the rye or wheat field, I know not; but I apprehend them to have it on the former: as rye is sown sooner than wheat; and the time of sowing might be too late for their autumnal fair.

" Whoever has seen the useless nastiness which is made by sheep at fairs, in the streets of great towns, will think this management of the Market-Weightoners highly deserving of imitation; especially in the latter end of the year, when the rains bring in much soil with the sheep.

" I would, however, venture to recommend one improvement to these sensible people, viz. after a certain number of years to plough up one of their sandy fields intirely, and to cross-plough it, and endeavour to mix the soil of the ridges and furrows thoroughly together, and then to make the furrows where the ridges were, &c. and to sow down the outward swathes of each land with seeds proper to the soil. The advantages hence resulting, are so obvious, that it would be an affront to their understandings to insist upon them." *Museum Rusticum, vol.* VI. *pag.* 83.

TILLER, a branch or stem of corn.

To TILLER, to spread or shoot out.

TILLS, tares, or vetches.

TILTH, *or* TILT, the condition of the earth after ploughing, &c.

TIMOTHY-GRASS, the name of a grass now cultivated in England, of which it is a native, though the seeds of it were carried from Virginia, by one Mr. Timothy Hanson, to North Carolina, where it is now cultivated by the inhabitants; and from this circumstance it received the name it now bears.

It thrives most in low, damp, marshy grounds; for in such soil and situation it will produce a fine turf in three weeks from the time of sowing the seed. It is very luxuriant, grows to a considerable height, and has in some sort the appearance of wheat or rye, having a broad blade or leaf.

All sorts of cattle are very fond of this herb whilst in a green growing state; and it will not be improper to add, that they are nearly, if not quite, as fond of it, when dried and made into hay: but when it is intended for this use, it should always be mown when it is in full sap, just before it flowers, for if it is left longer before it is cut, being so luxuriant and quick a grower, it becomes harsh, and is much dryer and more chirky food, than when it is cut in its prime.

" Timothy-grass, says an experienced farmer, in a letter to Dr. Templeman, is in appearance a coarse grass, very little promising to be a pasture agreeable to cattle. Indeed, its appearance so strongly prejudiced many against it, that it would have been at once condemned to neglect, had it not been rescued by the enterprizing disposition of Mr. Rocque, who had sown a considerable spot of ground with the seed first sent from America; yet the fact is, that, whilst in sap, it is more agreeable to horses and cattle than any other grass has been observed to be. Mr. Rocque's horse soon gave him a convincing proof of this; for having got loose, he left very fine lucerne, and the moment he reached the Timothy-grass, instead of ranging about, as usual with horses, he eat clean before him.

" Deer, which are very nice in their food, are so fond of it, that, as I am well assured by gentlemen from North-America, they sow Timothy-grass there on the skirts of their corn land near the woods; in order to keep the deer from eating their corn; the Timothy-grass being much more agreeable to them than even corn.

" The dry hay of the Timothy-grass is exceedingly agreeable to cattle, as appears from a remarkable instance mentioned in a conversation in the Society for the encouragements of arts, &c. A worthy husbandman, who had himself often experienced how fond his cows and horses were of it, carried a friend into the field, that he might have ocular demonstration of it. The husbandman took a tuft of dry Timothy-hay in his hand, and as soon as one of the cows saw it, she came instantly to feed on it, though there was plenty of good grass under foot. Another cow soon followed the first, and both eat greedily of it: but each of them refused to eat the hay of common grass, which happened to be mixed with it. So fond were the horses and cows of this hay, that they would follow a person having some of it in his hand, as readily as they would one who carried corn for them.

" A very great advantage attending the Timothy-grass is, that it thrives well in such wet marshy land as will scarcely yield any other good grass; and here, its numerous and matted roots make so strong a sward, that land which was before a loose mire, shall become so firm as to bear cattle and even carriages without their sinking into it.

" It is almost needless to add, that in order to sow Timothy-grass seed in such marshy land, it must be drained, and then all the inequalities common in such land, as well as the strong matted roots of coarse grass, should be taken up and burnt. The land being then ploughed and laid smooth, the ashes should be spread upon it, and the seed may be sown early in the autumn; or rather, the plants should be raised in a nursery, and set in it at six or eight inches distance, every way, from each other. This grass will also thrive well on a clay bottom, where water is apt to stagnate in rainy seasons.

" The Timothy-grass will grow to the height of three or four feet high. I have been assured by a gentleman, that he has seen it between five and six feet high in Virginia. If it is cut down before the seed ripens, it will soon shoot anew, and yield a good second crop. The fowl meadow grass grows to the height of about three feet, and will ripen its seed twice in a season: we may therefore infer, that it may be cut for hay thrice in a season. It is not an early grass; but as soon as it begins to shoot, it makes up for that loss by its speedy growth. During the drought of last summer, the second crop made a surprizingly quick progress. Its not being an early grass is perhaps no loss; for as it delights in rather moist meadows, the ground might be poached, were cattle tempted to go early to feed on it.

" If from some imperfection in the soil, the plants of either of these grasses do not fill the ground sufficiently, they may be let run to seed, which falling in the vacant spaces, soon supply the want. So far as we have yet observed in this country, these self-sown plants do not arrive at the size of the parent plants, which were set at due distances: and this affords good reason to think, that if the seed was sown in broad-cast, and the plants came up thick, they would in the same manner be stinted in their growth.

" The success of the Timothy-grass, when sown alone, demonstrates the utility of sowing the seeds of each grass separately, in order to form a just estimate of their comparative values: for though this grass is a native of England, being a species of the fox-tail, it has hitherto been rather neglected than cultivated, even though nature has pointed it out as an useful plant in wet meadows, by its early verdure and growth. I make no doubt but that the practice of raising grasses separately, will bring other no less valuable grasses to light."

TINE, a tooth or spike. And hence the common phrase, of giving two or three tinings, signifies to draw the harrows twice or thrice over the same spot of ground.

TIT, a small horse.

TORE, rowen, or winter-grass.

TOVET, or *Toset*, half a bushel.

TRAMEL, an instrument or device, made sometimes of leather, but more usually of ropes, fitted to a horse's legs to regulate his motion, and teach him to amble.

Tramel also signifies an iron instrument hanging in the chimney, whereon to hang pots or kettles over the fire.

TRANSPLANTING, the act of removing trees or plants from the places where they are sowed, or raised, and planting them in others. *See the articles* LUCERNE, PLANTING, &c.

TREE, the firſt and largeſt of the vegetable kind, conſiſting of a ſingle trunk, out of which ſpring forth branches and leaves.

Standard-trees are ſuch as naturally riſe to a great height, and are not topped. For the choice of trees of this kind to be tranſplanted out of a nurſery, Quintiney recommends us to ſuch as are ſtraight, ſix feet high at leaſt, and five or ſix inches thick at bottom, and three or four at top; the bark pretty ſmooth and ſhining, as a token of their youth, and of the good ſoil they grew in.

Dwarf-trees are ſuch as are kept low, and never ſuffered to have above half a foot or ſtem.

Heat is ſo eſſential to the growth of trees, that we ſee them grow larger and ſmaller in a ſort of gradation, as the climates in which they ſtand are more or leſs hot. The hotteſt countries yield in general the largeſt and talleſt trees, and thoſe alſo in much greater beauty and variety than the colder do; and even thoſe plants which are common to both arrive at a much greater bulk in the ſouthern, than in the northern climates; nay, there are ſome regions ſo bleak and chill, that they raiſe no vegetables at all to any conſiderable height. Greenland, Iceland, and the like places, afford no trees at all; and what ſhrubs grow in them are always little and low. In the warmer climates, where trees grow to a moderate ſize, any accidental diminution of the common heat is found very greatly to impede vegetation; and, even in England, the cold ſummers we ſometimes have, give us an evident proof of this; for though the corn and low plants have ſucceeded well enough, and gooſeberries, currants, raſberries and other low ſhrubs, have brought forth fruit in ſufficient plenty, yet the production of taller trees has been found very much hurt; and wallnuts, apples, and pears, have been very ſcarce among us.

Heat is heat, be it from what cauſe it will, and acts as well upon vegetation one way as another. Thus the heat of dung, and the artificial heat of coal fires in ſtoves, is found to ſupply the place of the ſun.

Great numbers of the Indian trees in their native ſoil flower twice in a year, and ſome flower and bear ripe fruit all the year round; and it is obſerved of theſe laſt, that they are at once the moſt frequent and moſt uſeful to the inhabitants; their fruit, which hang always on them in readineſs, containing cool juices, which are good in fevers, and other of the common diſeaſes of that hot country.

Plantations of uſeful trees might be made to very great advantage in many places in every country, and the country greatly enriched by it, while the public would be alſo benefited by it, ſince it would raiſe a continual ſupply of timber uſed in ſhip-building, and on other public as well as private occaſions.

We have, in many places, heaths, and other barren and uncultivated lands, of very great extent; and how great an advantage would it be to the public, to bring theſe to be truly valuable? Many, if not all of theſe heaths, would be found on trial capable of producing trees; and ſome of them are truly the remains of deſtroyed foreſts; and, though the profits to be reaped from the planting theſe would come late, yet the expence of doing it would be very trifling in compariſon of that profit, and the means eaſy.

The authors who have given rules for planting, having employed themſelves only about ſmall ſpots of ground, the eſtabliſhing orchards, or parks, are by no means to be ſuppoſed proper guides in attempts of this kind; and Monſieur de Buffon, who had a great opinion of the knowledge of our Evelyn and Miller, who ſeem to ſpeak of every thing from their own experience, found, when he ſet about large plantations, that their opinions and rules were erroneous; and was obliged to have recourſe to experiments only; which he varied a thouſand ways: and, though many of them proved unſucceſsful, yet they all gave hints towards others, by which the attempt might afterwards be brought to ſucceed.

This ſagacious enquirer into the operations of nature in the growth of vegetables, having ſet apart a conſiderable quantity of land for the trial, and procured a number of young trees, firſt divided the whole quantity into a number of ſmall ſquares, and, having made a plan of it, examined the nature, depth, and other circumſtances of the ſoil in each, and minuted the whole down on a proper part of the plan; that himſelf or whoever ſucceeded him might judge, from the different growths of a number of trees planted in the ſame ſtate in the different ſoils, the different advantages and diſadvantages of every circumſtance in the depth and nature of the ground, in regard to the growth of uſeful trees. Different numbers of labourers were employed about different ſpots of this ground, and the acorns for the young growth planted at different ſeaſons; but the reſult in general was, that what ſhould ſeem the beſt methods ſucceeded the worſt; and thoſe pieces where many labourers were employed, and the acorns planted before winter, were much thinner of young oaks, than thoſe where the leaſt labour had been beſtowed upon the ground, and where the acorns had been planted in the ſpring; but thoſe places which ſucceeded beſt from the ſowing, were thoſe which had the acorns planted in holes made by a pickax, without any preceding culture of the ground. And thoſe where the acorns had only been laid upon the earth, under the graſs, afforded a great number of vigorous young trees, though the greater part had been carried away by birds, and other devouring animals. Thoſe ſpots of ground where the acorns were ſet ſix inches deep, were much worſe furniſhed with young ſhoots, than thoſe where they had been buried but at an inch deep; and in ſome places where they were buried at a foot deep, not one ſhoot appeared, though in others where they had been buried at nine inches there were many.

Thoſe acorns which had been ſteeped for eight or nine days in wine lees, and in the water of the common ſewers, appeared out of the ground much earlier than thoſe which were put in without this previous management.

But the moſt ſucceſsful of all the trials was that of planting in the ſpring ſuch acorns as had been ſown together in another place, and had time to ſhoot there; of theſe ſcarce any failed, and the plantation was perfectly flouriſhing, though the growth of theſe young ſhoots was not ſo quick and vigorous as thoſe of the acorns which had remained, when firſt ſown; which was probably owing to the injury the tender radicles received in tranſplanting.

Thus ſucceeded the experiments by ſowing, while, of thoſe made by planting young trees, ſuch as had been brought out of woods, and places under covert, ſucceeded much worſe than thoſe which had grown in more expoſed places.

The young trees of the ſeveral parts of the plantation kept on their growth in the manner they had begun to ſhoot, thoſe of the more laboured parts continuing more weak, and lower than thoſe of the leſs laboured.

Thus were a number of neceſſary experiments carefully tried, and the reſult of the whole was, that to make a plantation of oaks, on a ſoil of the common clayey or loamy kind, the moſt ſucceſsful method is this: the acorns muſt be preſerved during the winter in the earth in this manner: let there be made a bed of earth ſix inches deep, on this place a layer of acorns two inches deep, over theſe lay a bed of another half foot of earth, over that another layer of acorns, and ſo on ſucceſſively, till as many are employed as there will be occaſion for; the whole is then to be covered with a foot depth of earth, to preſerve all from the froſt. In the beginning of March, theſe beds are to be opened, and the acorns which will by that time have ſhot out, and are then in reality ſo many young oaks, are to be planted out at a foot diſtance each, and the ſucceſs of a plantation of this kind need not be feared. This is a manner of planting that is done at a ſmall expence, and even that might be in a great meaſure ſpared, were it not for the birds and other devouring animals; ſince, could the acorns be defended from theſe, they might be only laid on the ſurface of the ground under the graſs in autumn, and they would infallibly ſhew themſelves in ſo many young oaks the ſucceeding ſpring.

It is eaſy to continue the carrying the acorns, when taken out of their winter's bed, to the place where they are to be planted, without doing them much injury; and the ſmall ſtop the tranſplanting puts to their growth, is in reality rather an advantage than an injury; ſince it only retards the young ſhoots for about three weeks, or leſs than that: and by that means ſecures them from the few cold mornings that may be expected about the time of their natural appearance.

For

For the planting, pruning, felling, grafting, &c. of trees, *see the articles* PLANTING, PRUNING.

TREFOIL, a genus of plants, the flower of which has a tubulous permanent empalement of one leaf: it is of the butterfly kind, drying in the empalement. The standard is reflexed, the wings are shorter than the standard, and the keel is shorter than the wings: it has ten stamina, nine are joined, and one is separate, terminated by single summits, and an almost oval germen supporting an awl-shaped style, crowned by a single stigma. The germen afterward becomes a short pod with one valve, containing a few roundish seeds.

Mr. Miller enumerates twelve different species of trefoil, the first of which is well known in England by the name of red clover; and the manner of cultivating this plant has been already described under the article CLOVER.

The second sort, namely, the white Dutch clover, grows naturally in most of the pastures in England, and is generally known among the country people by the name of white honey suckle.

This is an abiding plant, whose branches trail upon the ground, and send out roots from every joint, so that it thickens and makes the closest sward of any of the sown grasses; and it is the sweetest feed for all sorts of cattle yet known: therefore when land is designed to be laid down for pasture, with intent to continue so, it should be sown with the seeds of this plant. The usual allowance of this seed is eight pounds to one acre of land; but this should never be sown with corn, for if there is a crop of corn, the grass will be so weak under it, as to be scarce worth standing; but such is the covetousness of most farmers, that they will not be prevailed on to alter their old custom of laying down their grounds with a crop of corn, though they lose twice the value of their corn by the poorness of the grass, which will never come to a good sward, and one whole season is also lost; for if this seed is sown in the spring without corn, there will be a crop of hay to mow by the middle, or latter end of July, and a much better after-feed for cattle the following autumn and winter, than the grass which is sown with corn will produce the second year. The seed of this sort may also be sown in autumn, and this autumnal sowing, if the seeds grow kindly, will afford a good early crop of hay the following spring; and if, after the hay is taken off the land, the ground be well rolled, it will cause the clover to mat close upon the ground, and become a thick sward.

The seeds of this white Dutch clover is annually imported from Flanders, by way of Holland, whence it received the name of Dutch clover; not that it is more a native of that country than of this, for it is very common in moist pastures, in every county in England: but the seeds were never collected for sowing in this country till of late years; nor are there many persons here, even now, who save this seed, though it may be done if the same method, as is practised for the red clover, be taken with this sort; it should therefore be recommended to every farmer, who is desirous of improving his land, to sow carefully an acre or two of this white clover for seed, which will save him the expence of buying for some years, when the price is great; and there will be a sure market for any quantity he may have to spare.

The third sort, namely hop-clover, called by some yellow meadow trefoil, grows naturally among the grass in the upland pastures of this country; but the seeds are frequently sold in the shops, and are by many mixed with the other sorts of clover and grass-seeds, for laying down ground to pasture. This plant grows with upright branching stalks about a foot high, garnished with trifoliate leaves, whose lobes are oblong and heart-shaped, but reversed, the narrow point joining the foot stalks. The flowers, which are yellow, grow from the wings of the stalk, upon long foot-stalks, collected into oval imbricated heads, having naked empalements lying over each other like scales, somewhat like the flowers of hops, from whence the plant had the name of hop-clover. But there are two sorts of this clover, which grow naturally in England. The other is a much smaller plant than this, and generally known by the name of none-such, or yellow hop-trefoil.

The hop-clover is strongly recommended by the following circumstances. 1. It not only grows, but flourishes on the most barren sands, and therefore must be a very proper grass to cultivate on such unfertile soils, where any other grass that is worth notice will not grow at all. 2. It is not apt to swell cattle, as the red clover does. 3. In good ground it will continue long, and bear a very good seed or crop, as Mr. Tull, though prejudiced against clovers, confesses; and, by its flourishing both on sands and clay, which have not been ploughed for many years, it seems likely to continue long in any soil.

The fifth sort grows naturally on chalky lands in many parts of England; and in some countries the seed is sown after the same manner as the common red clover, especially on chalky ground, where it will thrive, and produce a better crop than clover. The stalks of this are hairy, and grow erect to the height of two feet or more, garnished with trifoliate leaves, standing upon long foot-stalks, whose lobes are longer than those of the red-clover, and have no marks of white; they are of a yellowish green colour, and are covered with soft hairs. The flowers grow in oval spikes at the end of the branches; they are of a pale copper colour; their petals are long and tubulous, but the brim is divided into two lips, as the other sorts.

This is known by the title of trefoil, in the places where it is cultivated; but the seedsmen sell the hop-clover by that name, so they make no distinction between this, the hop-clover, and none-such; therefore, by which of these three titles the seeds are bought, they prove the same.

This sort of trefoil is much cultivated in that part of Essex which borders on Cambridgeshire.

The sixth sort grows naturally in Spain and Italy; this has upright stalks near two feet high, which are hairy, garnished with trifoliate leaves, having roundish lobes, which are sawed at their points. The flowers are produced at the top of the stalk in long, obtuse, hairy spikes, of a bright red colour, so make a pretty appearance during their continuance. It is an annual plant, so is not proper for sowing as fodder.

The seventh sort is an annual plant, which grows naturally in the south of France and Italy; it rises with a strong smooth stalk near three feet high, garnished with trifoliate leaves, whose lobes are two inches and a half long, and near a quarter broad, standing upon long foot-stalks, which are embraced by stipulæ or sheaths their whole length. The flowers are produced at the top of the stalks in very long spikes; they are of a beautiful red colour, so make a fine appearance. It flowers in July, and the seeds ripen in autumn.

The eighth sort grows naturally in Spain and Italy; this rises with a slender stiff stalk near two feet high, garnished with trifoliate leaves, whose lobes are very narrow and hairy. The flowers are produced at the top of the stalks in oblong conical spikes; the indentures of their empalements end in long bristly hairs, which are almost equal in length; the spikes are hairy, and the flowers of a pale red colour.

The ninth sort is the common hare's foot trefoil, which grows naturally upon dry gravelly land in most parts of England, and is a sure indication of the sterility of the soil, for it is rarely seen upon good ground. This plant is seldom eat by cattle, so is unfit for pasture, and is only mentioned here because it is sometimes used in medicine; it is an annual plant, whose root decays soon after it has perfected seeds.

The tenth sort grows naturally on arable land in many parts of England; this has trailing stalks, which put out roots at their joints. The leaves stand upon long slender foot-stalks; the lobes are roundish, and sawed on their edges; the flowers are collected in roundish heads, standing upon slender foot-stalks, which rise from the wings of the stalks; these have bladdery empalements, which terminate in two teeth. When these lie on the ground, their globular heads, having a little blush of red on their upper side toward the sun, and the other part being white, have a great resemblance of strawberries, and from thence it was called strawberry trefoil.

These sorts are preserved in botanic gardens for variety; they are easily propagated by seeds, which may be fown on an open bed of ground, either in autumn or fpring.

The plants which come up in autumn, will grow much larger, and flower earlier in the fummer than thofe which are fown in the fpring, fo from thofe good feeds may be always obtained, whereas the others fometimes mifcarry. When the plants come up, they require no other care than to keep them clean from weeds, and thin them where they are too clofe.

The eleventh fort is the common melilot, which is ufed in medicine, and has been already defcribed under the article MELILOT, which fee.

The twelfth fort grows naturally in Bohemia and Auftria, but has been long cultivated in England as a medicinal plant, though at prefent it is rarely ufed; it is annual. The ftalks are large, hollow, and channelled; they rife about a foot high, garnifhed with trifoliate leaves, whofe lobes are oval, and flightly fawed on their edges, ftanding upon pretty long foot-ftalks. The flowers are collected in oblong fpikes, which ftand upon very long foot-ftalks, fpringing from the wings of the ftalk at every joint; they are of a pale blue colour fhaped like thofe of the common melilot; thefe appear in June and July, and are fucceeded by fmall yellow feeds, of a kidney fhape, two or three being included in each fhort pod. The whole plant has a very ftrong fcent like that of fenugreek, and perifhes foon after the feeds are ripe. *Miller's Gard. Dict.*

TRELLISES, a contrivance for fupporting the branches of fruit-trees, confifting of laths of wood croffing each other in the form of a lattice.

Some perfons who are very curious in their fruit, and who do not mind a little extraordinary expence, erect trellifes againft their walls, extending from the infide of one pier to the neareft infide of the next; where the walls are built with piers, as they muft be for this purpofe. This frame-work is conftructed in the fame manner as that for efpaliers, like which it need not be fet up till the trees are well fpread, and begin to bear fruit plentifully; for they may be trained till then againft any ordinary low efpalier of afh poles or other flender fticks, in order not needlefsly to expofe the trellifes to the injuries of the weather; becaufe thefe, being generally made of regularly cut yellow-deal, or oak, and run up higher, coft more. Every fourth upright rail or poft of the trellis fhould be much ftronger than the reft, and faftened to the wall with iron hooks, which it is beft to fix in the wall at the time of building it. Thefe ftrongeft upright pofts fhould be about three, but by no means more than four feet from each other. The crofs rails may be flight, as for common efpaliers; but they muft be laid much clofer together. For peach, nectarine, and apricot trees, for example, which, for the moft part, produce their fruit on the young wood, the fquares of the trellis frame fhould not exceed three or four inches; but for trees which continue to bear on the old wood, they may be five or fix inches wide, and for vines, eight or nine inches. The fhoots of the trees are faftened to this frame with ozier twigs, rope yarn, or any other foft bandage, in the fame manner as they are to efpaliers: for they muft not be nailed to either, becaufe that would injure the wood-work.

Thefe trellifes, which fhould project about two inches from the wall, are thought to contribute greatly to preferve the beauty of the fruit, by preventing its lying too clofe to the wall, whilft it has at the fame time all the advantages of the heat reflected therefrom: nor are the walls where thefe are ufed hurt by driving nails into their joints, and drawing them out again every year, at the hazard of pulling out fome of the mortar with them, and confequently of weakening the wall, and making holes in which fnails and other vermin take fhelter and breed.

TRENCH, a furrow cut in the earth for draining land. *See the articles* BOG and DRAINING.

TRENDLE, any thing that turns round.

To TREFALLOW, to plough land the third time before fowing.

TROUGH, a long veffel for holding water, &c.

TRUG, or TRUGG, a hod for mortar.

TRUNDLE, a fort of carriage with low wheels, for carrying heavy and cumberfome loads.

TRUNK, the ftem or body of a tree; or the part between the ground and the place where it divides into branches.

TRUSS, a bundle of hay, ftraw, &c.

A trufs of hay muft contain fifty-fix pounds, or half a hundred weight; thirty-fix truffes make a load. In June, July, and Auguft, a trufs of new hay muft weigh fixty pounds.

TRUSS *of flowers*, fignifies many flowers growing together on the head of a ftalk, as in the cowflip, auricula, &c.

TUBEROSE, or PALIANTHES, the name of a genus of flowers greatly cultivated, and much admired.

The varieties of this plant are the tuberofe with a double flower, the ftriped-leaved tuberofe, and the tuberofe with a fmaller flower; the laft is mentioned by feveral authors as a diftinct fpecies, but is certainly a variety.

This fort is frequent in the fouth of France, from whence the roots have been often brought to England early in the fpring, before thofe roots have arrived from Italy, which are annually imported; the ftalks of this are weaker, and do not rife fo high, and the flowers are fmaller than thofe of the common tuberofe; but in other refpects is the fame.

The tuberofe grows naturally in India, from whence it was firft brought to Europe, where it now thrives in the warmer parts, as well as in its native foil. The Genoefe are the people who cultivate this plant, to furnifh all the other countries where the roots cannot be propagated without great trouble and care, and from thence the roots are annually fent to England, Holland, and Germany. In moft parts of Italy, Sicily, and Spain, the roots thrive and propagate without care, where they are once planted.

This plant has been long cultivated in the Englifh gardens, for the exceeding beauty and fragrancy of its flowers; the roots of this are annually brought from Genoa, by the perfons who import orange trees; for as thefe roots are too tender to thrive in the full ground in England, fo there are few perfons who care to take the trouble of nurfing up their off-fets, till they become blowing roots, becaufe it will be two or three years before they arrive to a proper fize for producing flowers; and as they muft be protected from the froft in winter, the trouble and expence of covers is greater than the roots are worth; for they are generally fold pretty reafonable, by thofe who import them from Italy.

The double flowering is a variety of the firft, which was obtained from feed by Monf. Le Cour, of Leyden in Holland, who for many years was fo tenacious of parting with any of the roots, even after he had propagated them in fuch plenty, as to have more than he could plant, that he caufed them to be cut in pieces, that he might have the vanity to boaft of being the only perfon in Europe who was poffeffed of this flower; but of late years the roots have been fpread into many parts; and as there is no method to propagate this but by the off-fets, moft people who have had of this fort are careful to multiply and increafe it, which is done by planting the off-fets upon a moderate hot-bed early in March, and covering the bed in cold weather with mats or ftraw; in fummer they muft have plenty of water in dry weather. In this bed the roots may remain till the leaves decay in autumn; but if there fhould happen any froft before that time, the bed fhould be covered to guard the roots from the froft, becaufe if the froft enters fo low as to reach the roots, it will kill them; and if the leaves are injured by the froft, it will weaken the roots. Where there is a due care taken to fcreen them from froft, and too much wet, it will be the beft way to let the roots remain in the bed till the end of November, or the beginning of December, provided hard frofts do not fet in fooner; for the lefs time the roots are out of the ground, the ftronger they will be, and the fooner they will flower. When the roots are taken up, they fhould be cleaned from the earth, and laid up in dry fand, where they may be fecure from froft and wet; here they fhould remain until the feafon for planting them again: this fame method fhould be practifed by thofe who are defirous to cultivate the fingle fort in England, and alfo that with ftriped leaves muft be propagated the fame way.

We fhall next give directions for the management of thofe roots which are annually brought from Italy. And firft, in the choice of the roots, thofe which are the largeft

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and plumpest, if they are perfectly firm and sound, are the best, and the fewer off-sets they have, the stronger they will flower; but the under part of the roots should be particularly examined, because it is there that they first decay. After the roots are chosen, before they are planted, the off-sets should be taken off; for if these are left upon the roots, they will draw away part of the nourishment from the old root, whereby the flower-stems will be greatly weakened.

As the roots commonly arrive in England in the month of February or March, those who are desirous to have these early in flower, should make a moderate hot-bed soon after the roots arrive, which should have good rich earth laid upon the dung, about seven or eight inches deep; this bed should be covered with a frame, and when the bed is in a proper temperature for warmth, the roots should be planted at about six inches distance from each other every way. The upper part of the root should not be buried more than one inch in the ground; when the roots are planted, there should be but little water given them, until they shoot above-ground, for too much wet will rot them, when they are in an inactive state, but afterwards they will require plenty of water, especially when the season is warm. When the flower stems begin to appear, the bed should have a large share of air given to it; otherwise the stalks will draw up weak, and produce but few flowers; for the more air these plants enjoy in good weather, the stronger they will grow, and produce a great number of flowers; therefore, towards the beginning of May, the frame may be quite taken off the bed, and hoops fastened over it, to support a covering of mats, which need not be laid over but in the night, or in very cold weather, so that by enjoying the free open air, their stems will be large; and if they are well watered in dry weather, their flowers will be large, and a great number on each stem.

The first planting will require more care than those which are designed to come after them; for in order to have a succession of these flowers, the roots should be planted at three different times, viz. the first the beginning of March, the second the beginning of April, and the third at the end of that month, or the beginning of May; but the latter beds will require a much less quantity of dung than the first, especially that bed which is the last made; for if there is but warmth enough to put the roots in motion, it is as much as will be required; and this last bed will need no covering, for many times those roots which are planted in the full ground at this season, will produce strong flowers in autumn; but in order to secure their flowering, it is always the best way to plant them on a gentle hot-bed. As to the second bed, that should be arched over with hoops, and covered with mats every night, and in bad weather, otherwise the late frosts which frequently happen in May, will pinch them.

These plants may remain in the beds until the flowers are near expanding, at which time they may be carefully taken up, preserving the earth to their roots, and planted in pots, and then placed in the shade for about a week to recover their removal; after which time the pots may be removed into halls, or other apartments, where they will continue in beauty a long time, and their fragrant odour will perfume the air of the rooms where they are placed, and by having a succession of them, they may be continued from Midsummer to the end of October, or middle of November; but as the stems of these plants advance, there should be some sticks put down by each root, to which the stem should be fastened, to prevent their being broken by the wind.

It is a common practice with many people, to plant these roots in pots, and plunge the pots into a hot-bed; but there is much more trouble in raising them in this method than in that before directed; for if the roots are not planted in very small pots, there will be a necessity of making the beds much larger, in order to contain a quantity of the roots; and if they are first planted in small pots, they should be shaken out of these into pots of a larger size, when they begin to shoot out their flower stems, otherwise the stalks will be weak, and produce but few flowers; therefore the other method is to be preferred, as there is no danger in removing the roots, if it is done with care.

When the roots are strong, and properly managed, the stems will rise three or four feet high, and each stem will produce twenty flowers or more; and in this the great beauty of these flowers consists, for when there are but a few flowers upon the stalks, they will soon fade away, and must be frequently renewed; for the flowers are produced in spikes coming out alternately upon the stalk, the lower flowers opening first; and as these decay, those above them open; so that in proportion to the number of flowers upon each stalk, they continue in beauty a longer or shorter time.

The sort with double flowers will require a little more care, in order to have the flowers fair; but this care is chiefly at the time of blowing, for the flowers of this sort will not open, if they are exposed to the open air; therefore when the flowers are fully formed and near opening, the pots should be placed in an airy glass-case, or a shelter of glasses should be prepared for them, that the dews and rains may not fall upon them, for that will cause the flowers to rot away before they open, and the heat of the sun drawn through the glasses, will cause their flowers to expand very fair. With this management, Mr. Miller says he has had this sort with very double flowers extremely fair, and upwards of twenty upon one stem, so that they have made a beautiful appearance; but where this has not been practised, it is very rare to see one of them in any degree of beauty. *Miller's Gard. Dict.*

TUBULATED FLOWER, a term used to express those smaller flowers, a great number of which go to compose one large compound flower. These are called tubulated in distinction from another kind of them, which are from their shape called ligulated. The tubulated flofcules generally compose the disk, and the ligulated ones the radius of the compound flowers. The tubulated ones are formed into a hollow cylinder, which expands into a mouth at the top, and is divided into five equal segments, which stand expanded, and in some measure bent backwards.

TULIP, the name of a flower so well known as to need no description; and it would be to little purpose to enumerate the several varieties of these flowers, which may be seen in one good garden, since there is no end of their numbers; and what some people may value at a considerable rate, others reject: besides, there are annually a great variety of new flowers obtained from breeders, so those which are old, if they have not very good properties to recommend them, are thrown out and despised. I shall therefore point out the properties of a good tulip, according to the characteristics of the best florists of the present age. 1. It should have a tall strong stem. 2. The flower should consist of six leaves, three within, and three without; the former ought to be larger than the latter. 3. Their bottom should be proportioned to their top, and their upper part should be rounded off, and not terminate in a point. 4. These leaves, when opened, should neither turn inward, nor bend outward, but rather stand erect, and the flower should be of a middling size, neither over large, nor too small. 5. The stripes should be small and regular, arising from the bottom of the flower; for if there are any remains of the former self-coloured bottom, the flower is in danger of losing its stripes again. The chives should not be yellow, but of a brown colour. When a flower has all these properties, it is esteemed a good one.

Tulips are generally divided into three classes, according to their seasons of flowering; as Præcoces, or early blowers, Medias, or middling blowers, and Serotines, or late blowers; but there is no occasion for making any more distinctions than two, viz. early and late blowers.

The early blowing tulips are not near so fair, nor rise half so high, as the late ones, but are chiefly valued for appearing so early in the spring; some of which will flower the end of February in mild seasons, if planted in a warm border near a wall, pale, hedge, or other shelter, and a month after the others will succeed them; so that they keep flowering until the general season for the late flowers to blow, which is towards the end of April.

The roots of the early-blowing tulips should be planted the beginning of September in a warm border, near a wall,

wall, pale, or hedge, becaufe if they are put into an open fpot of ground, their buds are in danger of fuffering by morning frofts in the fpring. The foil for thefe fhould be renewed every year, where people intend to have them fair. The beft foil for this purpofe is that which is taken from a light loamy pafture, with the turf rotted amongft it; and to this fhould be added a fourth part of fea-fand. This mixture may be laid about eighteen inches deep, which will be fufficient; for thefe need not be planted more than four or five inches deep at moft. The off-fets fhould not be planted amongft the blowing roots, but in a border by themfelves, where they may be planted pretty clofely together, efpecially if they are fmall; but thefe fhould be taken up when their leaves decay, in the fame manner as the blowing roots, otherwife they would rot; for thefe are not fo hardy as the late blowers, nor do they increafe half fo faft as thofe, fo that a greater care is required to preferve the off-fets of them.

When thefe tulips come up in the fpring, the earth upon the furface of the borders fhould be gently ftirred and cleared from weeds; and as the buds appear, if the feafon fhould prove fevere, it will be of great fervice to cover them with mats, for want of which many times they are blighted, and the flower-buds decay before they blow, which is often injurious to the roots, as alfo the cropping of the flowers fo foon as they are blown, becaufe their roots, which are formed new every year, are not at that time arrived at their full magnitude, and are hereby deprived of proper nourifhment.

If, when thefe flowers are blown, the feafon fhould prove very warm, it will be proper to fhade them with mats, &c. in the heat of the day; as alfo if the nights are frofty, they fhould be in like manner covered, whereby they may be preferved a long time in beauty; but, when their flowers are decayed, and their feed veffels begin to fwell, they fhould be broken off juft at the top of the ftalks, becaufe if they are permitted to feed, it will injure the roots.

When the leaves of thefe flowers are decayed, which will be before the late blowers are out of flower, their roots fhould be taken up, and fpread upon mats in a fhady place to dry; after which they fhould be cleared from their filth, and put up in a dry place, where vermin cannot come to them, until the feafon for planting them again, being very careful to preferve every fort feparate, that you may know how to difpofe of them at the time for planting them again, becaufe it is the better way to plant all the roots of each fort together, and not to intermix them, as is commonly practifed in moft other kinds of flowers; for as there are few of them which blow at the fame time, fo, when the feveral roots of one fort are fcattered through a whole border, they make but an indifferent appearance; whereas, when twenty or thirty roots of the fame fort are placed together, they will all flower at the fame time, and have a better effect.

There are many curious perfons, who, in order to preferve their feveral kinds of tulips, and other bulbous-rooted flowers feparate, have large flat boxes made, which are divided into feveral fmall partitions, each of which is numbered in the fame manner as the divifions of their beds; fo that when a catalogue of their roots is made, and the numbers fixed to each fort in the beds, there is nothing more to do when the roots are taken up, but to put every kind into the divifion marked with the fame number which was placed to each fort in the bed, which faves a great deal of trouble, and effectually anfwers the purpofe of preferving the kinds feparate.

The late-blowing tulips are fo numerous, that, as I before obferved, it would be to no purpofe to attempt to give a catalogue of them. Thefe are generally obtained from breeders, which is a term applied to all fuch flowers as are produced from feeds which are of one felf-colour, and have good bottoms and chives; thefe in time break into various beautiful ftripes, according to the ground of their former felf-colour; but this muft be entirely thrown off, otherwife they do not efteem a flower well broken.

Of thefe breeders there hath been a great variety brought into England from Flanders of late years, which is the grand nurfery for moft forts of bulbous-rooted flowers; but there are fome curious perfons, who have lately obtained many valuable breeders from feed in England; and doubtlefs, were we as induftrious to fow the feeds of thefe flowers as the people of Holland and Flanders, we might in a few years have as great variety as is to be found in any part of Europe; for, although it is fix or feven years from the fowing before thefe flowers blow, yet, if after the firft fowing there is every year a frefh parcel fown, when the feven years are expired, there will be conftantly a fucceffion of roots to flower every year, which will reward the expectation, and keep up the fpirit of raifing; but it is the length of time at firft, which deters moft people from this work.

The manner of propagating thefe flowers from feeds is as follows: you fhould be careful in the choice of the feeds, without which there can be little fuccefs expected. The beft feed is that which is faved from breeders which have all the good properties before related, for the feeds of ftriped flowers feldom produce any thing that is valuable.

The beft method to obtain good feeds is to make choice of a parcel of fuch breeding tulip roots as you would fave feeds from, and plant them in a feparate bed from the other breeders, in a part of the garden where they may be fully expofed to the fun, obferving to plant them at leaft eight or nine inches deep; for if they are planted too fhallow, their ftems are apt to decay before their feed is perfected.

Thefe flowers fhould always be expofed to the weather, for if they are fhaded with mats, or any other covering, it will prevent their perfecting the feed. About the middle of July, a little fooner, or later, as the fummer is hotter or colder, the feeds will be fit to gather, which may be known by the drynefs of their ftalks, and the opening of the feed veffels; at which time it may be cut off, and preferved in the pods till the feafon for fowing it, being careful to put it up in a dry place, otherwife it will be fubject to mould, which will render it good for little.

Having faved a parcel of good feed, about the beginning of September is the beft feafon for fowing it, when there fhould be provided a parcel of fhallow feed pans or boxes, fix or eight inches deep, which fhould have holes in their bottoms to let the moifture pafs off; thefe muft be filled with frefh light earth, laying the furface very even, upon which the feeds fhould be fown as regularly as poffible, that they may not lie upon each other; then there fhould be fome of the fame light earth fifted over them; about half an inch thick. Thefe boxes or pans fhould be placed where they may have the morning fun till eleven of the clock, in which fituation they may remain until the middle of October, at which time they fhould be removed into a more open fituation, where they may enjoy the benefit of the fun all the day, and be fheltered from the north winds, where they fhould remain until winter, when they muft be placed on a fouth border, to fcreen them from froft; but in the fpring, when the plants are up, they fhould be again removed to their firft fituation; and if the feafon fhould be dry, they muft be refrefhed with water, while the plants remain green, but as foon as their tops begin to decay, there muft be no more given them, left it rot their tender bulbs; therefore the boxes fhould be placed in a fhady fituation during the fummer feafon, but not under the drip of trees.

Thefe plants, at their firft appearance, have very narrow graffy leaves, very like thofe of onions, and come up with bending heads, in the fame manner as they do; fo that perfons who are unacquainted with them, may pull them up inftead of grafs, whilft they are very young, before their leaves are a little more expanded; which is not performed the firft year, for they feldom appear before the middle of March; and they commonly decay about the latter end of May, or the beginning of June, according as the feafon is hotter or colder.

The weeds and mofs fhould alfo be cleared off from the furface of the earth in the boxes, and a little frefh earth fifted over them foon after their leaves decay, which will be of great fervice to the roots. Thefe boxes fhould be conftantly kept clear from weeds, which, if permitted to grow therein, when they are pulled up, their roots will be apt to draw the bulbs out of the ground. At Michaelmas they fhould be frefh earthed again, and as the winter comes on, they muft be again removed into the fun as before,

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and treated in the ſame manner, until the leaves decay, when the bulbs ſhould be carefully taken up, and put into a cool ſhady room till the end of Auguſt, when they ſhould be planted in beds of freſh ſandy earth, which ſhould have tiles laid under them, to prevent the roots from ſhooting downward, which they often do when there is nothing to ſtop them, and thereby they are deſtroyed. The earth of theſe beds ſhould be about five inches thick upon the tiles, which will be ſufficient for nouriſhing theſe roots while they are young.

The diſtance which theſe young bulbs ſhould be allowed, need not be more than two inches, nor ſhould they be planted above two inches deep; but towards the end of October it will be proper to cover the bed over with a little tanner's bark, about two inches deep, which will preſerve the roots from the froſt, and prevent moſs or weeds from growing over them; but, if the winter ſhould be very ſevere, it will be proper to cover the bed either with mats or peaſe-haulm, to prevent the froſt from entering the ground, becauſe theſe roots are much tenderer while young, than they are after they have acquired ſtrength.

In the ſpring the ſurface of the ground ſhould be gently ſtoned to make it clean, before the plants come up; and if the ſpring ſhould prove dry, they muſt be frequently refreſhed with water, during the time of their growth; but this muſt not be given to them in great quantities, leſt it rot their tender bulbs; and when the leaves are decayed, the roots ſhould be taken up, and treated in the ſame way as before.

When the bulbs are large enough to blow, they ſhould be planted in freſh beds at the diſtance, and in the ſame manner as old roots, where, when they flower, ſuch of them as are worthy to be preſerved ſhould be marked with ſticks; and at the ſeaſon for taking up the bulbs, they muſt be ſeparated from the others, in order to be planted as breeders in different beds; but you ſhould by no means throw out the reſt until they have flowered two or three years, becauſe it is impoſſible to judge exactly of their value in leſs time; for many, which at firſt flowering appear beautiful, will afterwards degenerate ſo as to be of little value; and others, which did not pleaſe at firſt, will many times improve, ſo that they ſhould be preſerved until their worth can be well judged of.

Having thus given an account of the method of raiſing theſe flowers from ſeeds, I ſhall now proceed to the management of the roots which are termed breeders, ſo as to have ſome of them every year break out into fine ſtripes.

There are ſome who pretend to have a ſecret how to make any ſort of breeders break into ſtripes whenever they pleaſe; but this, I dare ſay, is without foundation; for from many experiments which I and others have made of this kind, I could never find any certainty in this. All that can be done by art is, to ſhift the roots every year into freſh earth of different mixtures, and to different ſituations, by which method I have had very good ſucceſs.

The earth of theſe beds ſhould be every year different; for although it is generally agreed that lean, hungry, freſh earth doth haſten their breaking, and cauſe their ſtripes to be the finer and more beautiful, yet, if they are every year planted in the like ſoil, it will not have ſo much effect upon them, as if they were one year planted in one ſort of earth, and the next year in a very different one; as I have ſeveral times experienced; and if ſome fine ſtriped tulips are planted in the ſame beds with the breeders, intermixing them together, it will alſo cauſe the breeders to break the ſooner.

The beſt compoſt for theſe roots is a third part of freſh earth from a good paſture, which ſhould have the ſward rotted with it, a third part of ſea-ſand, and the other part ſifted lime rubbiſh; theſe ſhould be all mixed together ſix or eight months at leaſt before it is uſed, and ſhould be frequently turned to mix the parts well together. With this mixture the beds ſhould be made about two feet deep, after the following manner: after the old earth is taken from out of the bed to the depth intended, then ſome of the freſh earth ſhould be put in about eighteen inches thick; this ſhould be levelled exactly, and then lines drawn each way of the bed chequerwiſe, at ſix inches diſtance; upon the center of each croſs, ſhould be placed the tulip roots, in an upright poſition; and after having finiſhed the bed in this manner, the earth muſt be filled in, ſo as to raiſe the bed ſix or eight inches higher, obſerving, in doing this, not to diſplace any of the roots, and alſo to lay the top of the beds a little rounding, to throw off the wet.

There are many perſons who are ſo careleſs in planting their tulip roots, as only to dig and level the beds well, and then with a blunt dibble to make holes, into which they put the roots, and then fill up the holes with a rake; but this is by no means a good method; for the dibble, in making the holes, preſſes the earth cloſely on each ſide, and at the bottom, whereby the moiſture is often detained ſo long about the roots as to rot them, eſpecially if the ſoil is inclinable to bind; beſides, the earth being hard at the bottom of the bulbs, they cannot ſo eaſily emit their fibres, which muſt certainly prejudice the roots.

Theſe beds ſhould be ſunk, more or leſs, below the ſurface, according to the moiſture or dryneſs of the ground; for the roots ſhould be ſo elevated as never to have the water ſtand near the reach of their fibres in winter, for moiſture is very apt to rot them; ſo that where the ſoil is very wet, it will be proper to lay ſome lime rubbiſh under the earth, in order to drain off the wet, and the beds ſhould be entirely raiſed above the level of the ground; but to prevent their falling down into the walks, after froſt, or hard rains, it will be proper to raiſe the paths between them, either with ſea-coal aſhes or rubbiſh, eight or ten inches, which will ſupport the earth of the beds; and theſe paths may ſlope at each end from the middle, which will make paſſage for the water to run off as it falls. But where the ſoil is dry, the beds may be ſunk eighteen or twenty inches below the ſurface, for in ſuch places the beds need not be more than four or ſix inches above the ſurface, which will be allowance enough for their ſettling.

During the winter ſeaſon there will be no farther care required. The roots being planted thus deep, will be in no danger of ſuffering by ordinary froſts; but if the winter ſhould prove very ſevere, ſome rotten tan or peaſe-haulm may be laid over the beds to keep out the froſt during its continuance, but this muſt be removed when the froſt is over; and in the ſpring, when their leaves begin to appear above ground, the earth upon the ſurface of the beds ſhould be ſtirred to clear it from weeds, moſs, &c. and when the flower-buds begin to come up, they ſhould be guarded from froſt, otherwiſe they are very ſubject to blight and decay ſoon after they appear, if the froſt pinches their tops; but they need only be covered in ſuch nights when there is a proſpect of froſt, for at all other times they ſhould have as much open air as poſſible, without which they will draw up weak, and produce very ſmall flowers.

When theſe breeders are in flower, you ſhould carefully examine them to ſee if any of them have broken into beautiful ſtripes, which, if you obſerve, there ſhould be a ſtick put into the ground by every ſuch root to mark them, that they may be ſeparated from the breeders, to plant amongſt the ſtriped flowers the following year; but you ſhould carefully obſerve, whether they have thrown off their former colour entirely, as alſo when they decay, to ſee if they continue beautiful to the laſt, and not appear ſmeared over with the original colour; in both which caſes they are very ſubject to go back to their old colour the next year: but if their ſtripes are diſtinct and clear to the bottom, and continue ſo to the laſt, which is what the floriſts call dyeing well, there is no great danger of their returning back again, as hath been by ſome confidently reported; for if one of theſe flowers is quite broken, as it is termed, it will never loſe its ſtripes, though ſometimes they will blow much fairer than at other, and the flowers of the off-ſets will be often more beautiful than thoſe of the old roots.

This alteration in the colour of theſe flowers may be ſeen long before they are blown, for the green leaves will appear of a fainter colour, and ſeem to be ſtriped with white, or of a browniſh colour, which is a plain proof, that the juices of the whole plant are altered, or, at leaſt, the veſſels through which the juice is ſtrained; ſo that hereby particles of a different figure are capable of paſſing through them, which, when entered into the petals of the flower, reflect the rays of light in a different manner, which

which occaſions the variety we ſee in the colours of flowers. This breaking of the colours in flowers proceeds from weakneſs, or at leaſt is the cauſe of weakneſs in plants; for it is obſervable, that after tulips are broken into fine ſtripes, they never grow ſo tall as before, nor are the ſtems, leaves, or flowers ſo large; and it is the ſame in all variegated plants and flowers whatever, which are alſo much tenderer than they were before they were ſtriped; ſo that many ſorts of exotic plants, which by accident have become variegated in their leaves, are often rendered ſo tender, as not to be preſerved without much more care, though indeed ſtriping of tulips doth never occaſion ſo great weakneſs in them as to render them very tender. The greateſt effect it hath on them, is in leſſening their growth; the more beautifully their ſtripes appear, the ſhorter will be their ſtems, and the weaker their flowers.

There is nothing more to be obſerved in the culture of ſtriped flowers than what has been directed for breeders, excepting that theſe ſhould be arched over with tall hoops and rails, that they may be ſhaded from the ſun in the day-time, and protected from ſtrong winds, hard rains, and froſty mornings, otherwiſe the flowers will continue but a ſhort time in beauty; but where theſe inſtructions are duly followed, they may be preſerved in flower a full month, which is as long as moſt flowers continue.

There are ſome perſons who are ſo extremely fond of theſe flowers, as to be at a great expence in erecting large frames of iron work to cover their beds of tulips, in ſuch a manner, that they may walk between two beds under the frames, over which are ſpread tarpawlings, ſo as to keep off ſun, rain, and froſt, whereby they can view the flowers without being at the trouble of taking off or turning up the tarpawlings, or being incommoded by the ſun or rain, which cannot be avoided where the covering is low; beſides, by thus raiſing the covers, the flowers have a greater ſhare of air, ſo that they are not drawn ſo weak as they are when the covering is low and cloſe to them; but theſe frames being expenſive, can only be made by perſons of fortune; however, there may be ſome of wood contrived at a ſmaller expence, which, being arched over with hoops, may anſwer the purpoſe as well as the iron frames, though they are not ſo ſightly or laſting.

When the flowers are faded, the heads of all the fine ſorts ſhould be broken off, to prevent their ſeeding; for if this is not obſerved, they will not flower near ſo well the following year, nor will their ſtripes continue ſo perfect: this will alſo cauſe their ſtems to decay ſooner than otherwiſe they would do, ſo that their roots may be taken up in June; for they ſhould not remain in the ground after their leaves are decayed. In taking the roots out of the ground, you muſt be very careful not to bruiſe or cut them, which will endanger their rotting, and, if poſſible, it ſhould be done a day or two after rain. When theſe roots are taken out of the ground, they muſt be cleared from their old covers, and all ſorts of filth, and ſpread upon mats in a ſhady place to dry; after which they ſhould be put up in a dry place, where vermin cannot get to them, obſerving to keep every ſort ſeparated; but they ſhould not be kept too cloſe from the air, nor ſuffered to lie in heaps together, leſt they ſhould grow mouldy; for if any of the roots once take the mould, they commonly rot when they are planted again.

The offsets of theſe roots, which are not large enough to produce flowers the ſucceeding year, ſhould be alſo put by themſelves, keeping each ſort diſtinct: theſe ſhould be planted about a month earlier in autumn than the blowing roots, in particular beds by themſelves, in the flower nurſery, where they may not be expoſed to public view; but the earth of the beds ſhould be prepared for them in the ſame manner as for larger roots; theſe ſhould not be planted above five inches deep, becauſe they are not ſtrong enough to puſh through ſo great covering of the earth as the old roots; they may alſo be placed much nearer together than thoſe which are to flower, and in one year moſt of them will become ſtrong enough to flower, when they may be removed into the flower-garden, and placed in the beds amongſt thoſe of the ſame kinds. *Miller's Gard. Dict.*

Tulip-Tree, a very beautiful American tree, which produces flowers, ſuppoſed like thoſe of the tulip.

This tree, which is a native of North America, and where it grows to be a tree of the firſt magnitude, is generally known through all the Engliſh ſettlements by the title of poplar. Of late years there has been great numbers of theſe trees raiſed from ſeeds in the Engliſh gardens, ſo that now they are become common in the nurſeries about London, and there are many of the trees in ſeveral parts of England, which do annually produce flowers. The firſt tree of this kind which flowered here, was in the gardens of the late earl of Peterborough at Parſons-green near Fulham, which was planted in a wilderneſs among other trees. Before this was planted in the open air, the few plants which were then in the Engliſh gardens, were kept in pots or tubs, and houſed in winter, ſuppoſing they were too tender to live in the open air; but this tree ſoon after it was planted in the full ground, convinced the gardeners of their miſtake, by the great progreſs it made, while thoſe which were kept in pots and tubs, increaſed ſlowly in their growth; ſo that afterwards there were many others planted in the full ground, which are now arrived to a large ſize, eſpecially thoſe which were planted in a moiſt ſoil. One of the handſomeſt trees of this kind near London, is in the garden of Waltham-Abbey; and at Wilton, the ſeat of the earl of Pembroke, there are ſome trees of great bulk; but the old tree at Parſons-green is quite deſtroyed by the other trees which were ſuffered to overhang it, and rob it of its nouriſhment, from a fear of taking down the neighbouring trees, and admitting the cold air to the tulip-tree, it ſhould injure it.

The young ſhoots of this tree are covered with a ſmooth purpliſh bark, garniſhed with large leaves, whoſe footſtalks are long; they are ranged alternate; the leaves are of a ſingular form, being divided into three lobes; the middle lobe is blunt and hollowed at the point, appearing as if it had been cut with ſciſſars. The two ſide lobes are rounded, and end in blunt points. The upper ſurface is ſmooth, and of a lucid green; the under is of a pale green. The flowers are produced at the end of the branches; they are compoſed of ſix petals, three without and three within, which form a ſort of bell-ſhaped flower, from whence the inhabitants of North America gave it the name of Tulip. Theſe petals are marked with green, yellow and red ſpots, ſo make a fine appearance when the trees are well charged with flowers. The time of this tree's flowering is in July, and when the flowers drop, the germen ſwells and forms a kind of cone; but theſe do not ripen in England.

This tree is propagated by ſeeds, which are now annually imported in great plenty from America. Theſe ſhould be ſown as ſoon as they arrive, in pots or tubs, filled with light earth, from the kitchen garden, or in a bed in the full ground. Thoſe which are ſown in the firſt way, may be placed on a very gentle hot hed, which will forward their growth; ſo that if they come up the ſame ſeaſon, the plants will acquire more ſtrength before winter. When the plants appear, they muſt be ſhaded in the heat of the day from the ſun, but freſh air muſt be admitted daily to prevent their drawing up weak; and as the ſeaſon advances, they muſt be gradually hardened to bear the open air. While the plants are young they do not care for much ſun, ſo they ſhould be either ſhaded, or placed where the morning ſun only ſhines upon them; they muſt alſo be conſtantly ſupplied with water, but not have it in too great plenty. As the young plants commonly continue growing late in the ſummer, ſo when there happens early froſts in autumn, it often kills their tender tops, which occaſions their dying down a conſiderable length in winter; therefore they ſhould be carefully guarded againſt theſe firſt froſts, which are always more hurtful to them than harder froſts afterwards, when their roots are better hardened; however, the firſt winter after the plants come up, it will be the better way to ſhelter them in a common hot-bed frame, or to arch them over with hoops, and cover them with mats, expoſing them always to the open air in mild weather.

The following ſpring, juſt before the plants begin to ſhoot, they ſhould be tranſplanted into nurſery beds, in a ſheltered ſituation, where they are not too much expoſed to the ſun. The ſoil of theſe beds ſhould be a ſoft gentle loam, not too ſtiff, nor over light; this ſhould be well wrought, and the clods well broken and made fine. There muſt be great care taken not to break the roots of the plants in taking them up, for they are very tender; then they ſhould be planted again as ſoon as poſſible, for if their roots are long out of the ground, they will be much injured thereby. Theſe may be planted in rows at about a foot diſtance, and at ſix inches diſtance in the rows; for as they ſhould not remain long in theſe nurſery-beds, ſo this will be room enough for them to grow; and by having them ſo cloſe they may be ſhaded in the ſummer, or ſheltered in the winter, with more eaſe than when they are farther apart.

When the plants are thus planted, if the ſurface of the beds is covered with rotten tanners bark, or with moſs, it will prevent the earth from drying too faſt; ſo that the plants will not require to be ſo often watered, as they muſt be where they are expoſed to the ſun and air; after this, the farther care will be to keep them clean from weeds, and if the latter part of the ſummer ſhould prove moiſt, it will occaſion the plants growing late in autumn, ſo their tops will be tender and liable to be killed by the firſt froſts. In this caſe they ſhould be covered with mats to protect them.

If the plants make great progreſs the firſt ſummer, they may be tranſplanted again the following ſpring; part of them may be planted in the places where they are to remain, and the other ſhould be planted in a nurſery where they may grow two years, to acquire ſtrength before they are planted out for good; though the younger they are planted in the places where they are to ſtand, the larger they will grow, for the roots run out into length; and when they are cut it greatly retards their growth, ſo that theſe trees ſhould never be removed large; for they rarely ſucceed, if tranſplanted when they are grown to a large ſize. Some indeed that have been removed pretty large, have ſurvived their removal; but young plants of two years old, which were planted near them, were much larger in fifteen years than the old ones.

When the ſeeds are ſown upon a bed in the full ground, the bed ſhould be arched over with hoops, and ſhaded in the heat of the day from the ſun, and frequently refreſhed with water; as ſhould alſo the plants when they appear, for when they are expoſed much to the ſun while young, they make but ſmall progreſs. The care of theſe in ſummer muſt be to keep them clean from weeds, ſupplying them duly with water, and ſhading them from the ſun in hot weather; but as theſe ſeeds will not come up ſo ſoon as thoſe which were placed on a hot-bed, they generally continue growing later in autumn, therefore will require ſhelter from the early froſts in autumn; for as the ſhoots of theſe will be much ſofter than thoſe of plants which had longer time to grow, ſo if the autumnal froſts ſhould prove ſevere, they will be in danger of being killed down to the ſurface of the ground, by which the whole ſummer's growth will be loſt; and ſometimes the plants are entirely killed the firſt winter if they are not protected.

As theſe plants will not have advanced ſo much in their growth as the other, they ſhould remain in the ſeed-bed to have another year's growth before they are removed; therefore all that will be neceſſary to obſerve the ſecond year, is to keep them clean from weeds; and now they will not be in ſo much danger of ſuffering from the warmth of the ſun as before, therefore will not require ſuch conſtant care to ſhade them, nor ſhould the watering of them be continued longer than the ſpring; for if the autumn ſhould prove dry, it will prevent the plants from ſhooting late, and harden thoſe ſhoots which were made early in the year, whereby the plants will be in leſs danger from the early froſts.

After the plants have grown two years in the ſeed-bed, they will be ſtrong enough to remove; therefore, in the ſpring, juſt at the time when their buds begin to ſwell, they ſhould be carefully taken up, and tranſplanted into nurſery-beds, and treated in the ſame way as has been before directed for the plants which were raiſed in pots.

There are ſome people who propagate this tree by layers, but the layers are commonly two or three years before they take root; and the plants ſo raiſed, ſeldom make ſuch ſtraight trees as thoſe raiſed from ſeeds, though indeed they will produce flowers ſooner, as is always the caſe with ſtinted plants.

This tree ſhould be planted on a light loamy ſoil, not too dry, on which it will thrive much better than upon a ſtrong clay, or a dry gravelly ground; for in America they are chiefly found upon a moiſt light ſoil, where they will grow to a prodigious ſize, though it will not be proper to plant theſe trees in a ſoil which is too moiſt, in England, becauſe it might endanger the rotting of the fibres of the roots, by the moiſture continuing too long about them, eſpecially if the bottom be a clay, or a ſtrong loam, which will detain the wet. *Miller's Gar. Dict.*

TUMBLER, a name given to a particular ſpecies of pigeon, called by Moore the columba revolvens.

It has its name from its peculiar property of tumbling, when it is in the air, which they are very fond of doing; and effect exactly in the ſame manner as our poſture-maſters do it, by throwing themſelves over backwards. It is a very ſmall pigeon, and is always ſhort-bodied, full-breaſted, thin-necked, narrow-beaked, and has a ſmall ſhort head; the iris of the eye, in this ſpecies, is uſually of a bright pearl colour.

The Engliſh tumbler is uſually of one plain colour; black, blue, or white: the Dutch is much of the ſame make, but has different colours, and is feathered on the legs ſometimes: it has alſo a larger head, and thin ſkin round the eye. Some of the fineſt pigeons of this ſort are bred from a mixture of the Dutch and Engliſh kinds.

Theſe pigeons are remarkable for the height they fly to; they never ramble far from home, but will riſe almoſt perpendicularly, till they appear no larger than a ſparrow, or become quite out of ſight: they will often keep at this height five or ſix hours, and then come gradually down again: they will never tumble when they are at any great height, but only as they aſcend or come down again. There are particular times alſo, at which thoſe birds will take much higher flights than at others; but they ought to be kept by themſelves, and practiſed to it by the company of one of their own ſpecies; for if they mix, while young, with other pigeons, they will learn to fly as they do: a flight of a dozen of theſe birds ſent out together will keep ſo cloſe as to be all in a compaſs that might be covered with a handkerchief; but they ſhould never be turned out in foggy weather, or in high winds; in the firſt caſe they loſe ſight of their home, and perhaps never find it again, and, in the others, they are blown away; and, if they return, it is not till another day: in the mean time, lying out, they are in danger of cats, and other accidents.

Laſtly, the hen ſhould never be turned out with egg, for ſhe is then ſick, and not fit for flying; and, beſides, often drops her egg, and the breed is loſt by it. *Moore's Columbarium.*

TUMBREL, a dung-cart.

TUMOUR, a preternatural ſwelling or eminence riſing in any part of a horſe, and ariſes either from external injuries, or internal cauſes.

Swellings cauſed by external accidents, as blows and bruiſes, ſhould at firſt be treated with reſtringents; thus, let the part be bathed frequently with hot vinegar or verjuice, and, where it will admit of bandage, let a flannel wetted with the ſame be rowled on: if by this method the ſwelling does not ſubſide, apply, eſpecially on the legs, a poultice with red wine lees, ſtrong beer grounds, and oatmeal, or with vinegar, oil, and oatmeal; either of theſe may be continued twice a day, after bathing, till the ſwelling abates; when, in order to diſperſe it intirely, the vinegar ſhould be changed for camphorated ſpirit of wine, to four ounces of which, may be added one of ſpirit of ſal armoniac; or it may be bathed with a mixture of two ounces of crude ſal armoniac boiled in a quart of chamber-lye, twice a day, and rags dipped in the ſame may be rowled on.

Fomentation made by boiling wormwood, bay-leaves, and roſemary, and adding a proper quantity of ſpirits, are often of great ſervice to thin the juices, and fit them for tranſpiration; eſpecially if the injury has affected the joints.

But in bruiſes, where the extravaſated blood will not by theſe means be diſperſed, the ſhorteſt way is to open the ſkin, and let out the grumes.

Critical tumours, or ſwellings which terminate fevers, ſhould by no means be diſperſed; except when they fall on the paſtern or coffin joint, ſo as to endanger them: in this caſe the diſcutient fomentation ſhould be applied three or four times a day, and a cloth or flannel frequently wrung out of the fame fhould be bound on, in order to keep the joint continually breathing.

But if the fwelling fixes under the jaws, behind the ears, on the poll, withers, or in the groins and fheath, &c. it fhould be encouraged and forwarded by ripening poultices, wherever they can be applied; oatmeal boiled foft in milk, to which a proper quantity of oil and lard is added, may anfwer this purpofe; or the poultice recommended in treating of the ftrangles: thefe muft be applied twice a day, till the matter is perceived to fluctuate under the fingers, when it ought to be let out; for which purpofe, let the tumour be opened with a knife or ftrong launcet, the whole length of the fwelling, if it can be done fafely, for nothing contributes fo much to a kind healing, as the matter's having a free difcharge, and the openings being big enough to drefs to the bottom.

Pledgits of tow fpread with black or yellow bafilicon (or the wound ointment) and dipped in the fame, melted down with a fifth part of oil of turpentine, fhould be applied to the bottom of the fore, and filled up lightly with the fame, without cramming; it may be thus dreffed once or twice a day, if the difcharge is great, till a proper digeftion is procured, when it fhould be changed for pledgits fpread with the red precipitate ointment, applied in the fame manner.

Should the fore not digeft kindly, but run a thin water and look pale, foment as often as you drefs, with the above fomentation; and apply over your dreffing the ftrong beer poultice, and continue this method till the matter grows thick, and the fore florid.

The following ointments will generally anfwer your expectations in all common cafes, and may be prepared without, as well as with, the verdigreafe.

> Take Venice turpentine and bees wax, of each a pound; oil of olives one pound and a half; yellow rofin twelve ounces: when melted together, two or three ounces of verdigreafe finely powdered may be ftirred in, and kept fo till cold, to prevent its fubfiding.

> Take of yellow bafilicon, or the above ointment without verdigreafe, four ounces; and red precipitate finely powdered half an ounce: mix them together cold, with a knife or fpatula.

This laft applied early, will prevent a fungus, or proud flefh, from fhooting out; for if you drefs too long with the above digeftive, the fungus will rife faft, and give fome trouble to fupprefs it; when it will be neceffary to wafh the fore as often as you drefs, with a folution of blue vitriol in water, or to fprinkle it with burnt allum and precipitate. If thefe fhould not be powerful enough, touch with a cauftic, or wafh with the fublimate water, made by diffolving half an ounce of corrofive fublimate in a pint of lime-water.

But this trouble may in a great meafure be prevented, if the fore is on a part where bandage can be applied with compreffes of linen cloth: for even when thefe excrefcences regerminate, as it were, under the knife, and fpring up in fpite of the cauftics above-mentioned, they are to be fubdued by moderate compreffion made on the fprouting fibres, by thefe means.

Authors on farriery have in general given very proper receipts to anfwer every intention of this kind by medicines; but as they have not, I think, laid down fufficient rules for their application in thofe cafes where they are moft wanted, I hope the following general directions will not be unacceptable; as the difficulty in healing fome kinds of fores arifes frequently from the unfkilful manner of dreffing them.

It may be neceffary then to obferve here once for all, that the cures of moft fores are effected by the fimpleft methods, and that it is often of much more confequence to know how to drefs a fore, than what to drefs it with; and in this confifts indeed the chief art of this branch of furgery; for the moft eminent in that profeffion have long fince difcovered, that variety of ointments and falves are unneceffary in the cure of moft wounds and fores, and they have accordingly difcarded the greateft part, formerly in repute for that purpofe; repeated obfervations having taught them, that after the digeftion, nature is generally difpofed to heal up the wound faft enough herfelf, and that the furgeon's chief care is to prevent a luxuriancy, commonly called proud flefh; which all ointments wherein lard or oil enters, are but too prone to encourage, as they keep the fibres too lax and fupple; and which dry lint alone, early applied, as eafily prevents, by its abforbing quality, and light compreffion on the fprouting fibres.

Thus if a hollow wound or fore is crammed with tents, or the dreffings are applied too hard, the tender fhoots of flefh from the bottom are prevented pufhing up; and the fides of the fore in time from this diftenfion may grow horney, and turn fiftulous; nor has the matter by this method a free difcharge.

On the other hand, if fores of any depth are dreffed fuperficially, the external parts being more difpofed to heal and come together than the internal, they will fall into contact, or heal too foon; and the fore not filling up properly from the bottom, will break out afrefh.

Hence we may juftly conceive how little ftrefs is to be laid on famous ointments, or family falves, unfkilfully applied; for unlefs this due medium is obferved, or obtained in the dreffing, no hollow fore can heal up properly.

I thought it neceffary to be a little explicit on this head, as gentlemen fo frequently complain of being difappointed in their cures, notwithftanding the excellency of their ointment, or balfam; and to convince them that lefs confidence fhould be put in thefe favourite medicines than is generally imagined; for where the habit is found, and the blood and juices in good condition, there are few fimple dreffings that will not fucceed; and when otherwife, the moft pompous will not avail, till thefe are rectified by proper internal medicines.

As foon then as a good digeftion is procured (which is known by the thicknefs and whitenefs of the matter difcharged, and the florid red colour at the bottom of the fore) let the dreffings be changed for the precipitate medicine; or the fore may be filled up with dry lint alone, or dipped in lime-water with a little honey and tincture of myrrh, or brandy: about a fifth part of the latter to one of the former; a pledgit of lint dipped in this mixture fhould alfo be applied to the bottom of the fore, which fhould be filled up with others to the furface or edges, but not crammed in too hard, as before obferved, nor yet applied too loofely.

By this method, the fore would incarn, or heal up properly, and foft fpongy flefh would be prevented, or fuppreffed in time; whereas when ointments or falves are too long continued, a fungus or proud flefh, is thereby fo encouraged in its growth, that it requires fome time to deftroy and eat it down again: a proper comprefs of cloth, and a linnen rowler is abfolutely neceffary both for this purpofe, and to fecure on the dreffings, wherever they can conveniently be applied. *Bartlet's Farriery, pag.* 236.

TUPP, a ram.

TUPPING-TIME, ramming time.

TURF, a blackifh, fulphureous earth, ufed in feveral parts of England, Holland, and Flanders, as fewel.

In Flanders, their turf is dry or pared from off the furface of the earth, and cut in form of bricks. The fedge, or fpecies of grafs growing very thick on the turf earth, contributes greatly, when dry, to the maintenance of the fire.

The Dutch take their turf from the bottom of the dykes or canals which run acrofs moft of their lands; by which means they not only fupply the defect of wood, which is very great in moft of the United Provinces, but alfo keep their dykes clear and navigable: this turf earth is very black. As they take it up from the bottom of the dykes, they fpread it about the edges, of fuch a thicknefs, as that it may be reduced to three inches when moderately dried. In this condition they cut it into pieces of turfs feven or eight inches long, and three broad, and, to complete the drying, lay them up in heaps, and at laft in ftacks.

In the north of England, Scotland, &c. turf is dug out of foft, moift, rotten earth, called peatmofs. They dig horizontally from the furface, to the depth of about four feet, with a fpade, which at once fafhions and takes them out in parallelopipeds nine or ten inches long, and three fquare; which are fpread on the ground to drain as faft as dug; and then fet up an end three or four againft each other, for the wind to blow through them; and at

laft

laſt they are ſtacked or houſed. The pits or dykes in a few years fill up again, and afford a freſh crop.

TURF-ASHES. *See the article* ASHES.

TURF-BOGS. *See* BOG, MOOR, and MOSS.

TURFING-SPADE, an inſtrument uſed to under-cut the turf, after it is marked out with the plough.

TURKEY, the name of a well known fowl, reared in many parts of England.

" Moſt of our houſewives, ſays a Swediſh author on huſbandry, have long deſpaired of ſucceſs in rearing turkeys, and complained that the profit rarely indemnifies them for their trouble and loſs of time: whereas, continues he, little more is to be done than to plunge the chick into a veſſel of cold water, the very hour, or if that cannot be, the day it is hatched, forcing it to ſwallow one whole pepper-corn, and then reſtoring it to its mother. From that time it will become hardy, and fear the cold no more than a hen's chick. After which it muſt be remembered that theſe uſeful creatures are ſubject to one particular malady whilſt they are young, which carries them off in a few days. When they begin to droop, examine carefully the feathers on their rump, and you will find two or three, whoſe quill part is filled with blood. Upon drawing theſe the chick recovers, and after that requires no other care than what is commonly beſtowed on poultry that range the court-yard.

" Theſe articles are too true to be denied; and in proof of the ſucceſs, three pariſhes in Sweden have, for many years, gained ſeveral hundred pounds by rearing and ſelling turkeys." *Rural Oeconomy, pag.* 739.

TURNEP, or *Turnip*, an eſculent plant, of which there are three ſpecies enumerated by Miller. The firſt is the turnip which is commonly cultivated in the fields, of which there are the following varieties, viz. the round red or purple topped turnip, the green topped turnip, the yellow turnip, the black rooted turnip, and the early Dutch turnip. The laſt ſort is commonly ſown early in the ſpring, to ſupply the markets in May and June, but is never cultivated for a general crop. The red rooted turnip was formerly more cultivated in England than at preſent; for ſince the large green topped turnip has been introduced, all the ſkilful farmers prefer it to the other ſorts; the roots of the green will grow to a large ſize, and continue good much longer than the other ſorts. The next to this is the red or purple topped turnip, which will alſo grow large, and is extremely good for ſome time; but the roots of this will become ſtringy much ſooner than thoſe of the green topped. The long rooted turnip, the yellow turnip, and the blackiſh rooted turnip, are now rarely cultivated in England, neither of them being ſo good for the table or for feed, as the red and green topped turnip, though there are ſome few perſons who ſow them for the ſake of variety.

The French turnip is not much cultivated in England, but in France and Holland they are in great eſteem, eſpecially for ſoups; their roots being ſmall, are boiled whole in the ſoup, and ſo ſerved up to the table; theſe muſt be uſed while they are young, otherwiſe they will become rank and ſtringy.

Theſe are ſuppoſed to be only varieties, which have accidentally been obtained from ſeeds, therefore I have not enumerated them as diſtinct ſpecies; but yet I am certain they are conſtant, where care is taken in the ſaving of their ſeeds not to ſuffer any mixture to ſtand for ſeeds: I have ſown of three or four ſorts ſeveral years, and have always found them retain their differences; however, it is not eaſy to determine if ſome of theſe were not by culture firſt obtained from ſeeds of the common white turnip. The yellow turnip ſeems moſt unlikely to have been an accidental variety, for I have never known this alter, and the roots are yellow within, whereas all the other have white fleſh, notwithſtanding their outſides are of very different colours.

The long rooted turnip is, I think, a diſtinct ſpecies, the form of the root, and its manner of growth being totally different from the other ſorts. I have ſeen theſe roots as long as thoſe of the parſnip, and nearly of the ſame ſhape; theſe run deep into the ground, ſo are unfit for feeding of cattle; and unleſs they are uſed very young, become ſtrong, ſo not proper for the table, which has occaſioned their being rejected of late years.

The green topped turnip grows above ground more than any of the other, which renders it preferable for feeding of cattle; and being the ſofteſt and ſweeteſt root when grown large of any of the kinds, is moſt eſteemed for the table; but in very ſevere winters they are in greater danger of ſuffering by froſt, than thoſe whoſe roots lie more in the ground, eſpecially if they are not covered by ſnow; for when they are frequently hard frozen and thawed, it cauſes them to rot ſooner than thoſe whoſe fleſh is leſs tender and ſweet. I have ſeen the roots of this ſort, which were more than a foot diameter, boiled, and were as ſweet and tender, as any of the ſmalleſt roots.

Turnips delight in a light, ſandy, loamy ſoil, which muſt not be rich; for in a rich ſoil they grow rank and are ſticky, but if it be moiſt they will thrive the better in ſummer, eſpecially in freſh land, where they are always ſweeter than upon an old worn-out or a rich ſoil.

The common ſeaſon for ſowing of turnips, is any time from the beginning of June to the middle of Auguſt, or a little later; though it is not adviſeable to ſow them much after, becauſe, if the autumn ſhould not prove very mild, they will not have time to apple before winter, nor will the roots of thoſe which are ſown after the middle of July, grow very large, unleſs the froſt keeps off long in autumn. But, notwithſtanding this is the general ſeaſon in which the greateſt part of turnips are ſown in the country, yet, about London, they are ſown ſucceſſively from March to Auguſt, by thoſe who propagate them to ſupply the markets with their roots; but there is a great hazard of loſing thoſe which are ſown early in the year, if the ſeaſon ſhould prove dry, by the fly, which will devour whole fields of this plant while young; ſo that where a ſmall quantity for the ſupply of a family is wanted, it will be abſolutely neceſſary to water them in dry weather; and where a perſon ſows thoſe ſeeds in April and May, it ſhould always be upon a moiſt ſoil, otherwiſe they ſeldom come to good, the heat of the weather at that ſeaſon being too great for them upon a dry ſoil; but thoſe which are ſown towards the middle or latter end of June, commonly receive ſome refreſhing ſhowers to bring them forward; without which, it is very common to have them all deſtroyed.

Theſe ſeeds ſhould always be ſown upon an open ſpot of ground; for if they are near hedges, walls, buildings, or trees, they will draw up, and be very long topped, but their roots will not grow to any ſize.

They are ſown in great plenty in the fields near London, not only for the uſe of the kitchen, but for food for cattle in winter, when there is a ſcarcity of other food; and this way is become a great improvement to barren ſandy lands, particularly in Norfolk, where, by the culture of turnips, many perſons have doubled the yearly value of their ground.

The land upon which this ſeed is ſown, ſhould be ploughed in April, and twy-fallowed in May, that is once more ploughed and twice well harrowed, and made very fine; then the ſeed ſhould be ſown pretty thin; for it being ſmall, a little will ſow a large piece of ground; one pound is the common allowance for an acre of land. The ſeed muſt be harrowed in as ſoon as it is ſown, with a ſhort-tined harrow, and the ground rolled with a wooden roll, to break the clods, and make the ſurface even. In ten days or a fortnight after ſowing, the plants will come up; at which time, if the ſeaſon ſhould prove dry, they will be in great danger of being deſtroyed by the fly; but if it ſo happen, the ground muſt be ſowed again, for the ſeed being cheap, the chief expence is the labour; but the ground ſhould be firſt harrowed to looſen it, eſpecially if it is ſtiff land.

When the plants have got four or five leaves, they ſhould be hoed to deſtroy the weeds, and to cut up the plants where they are too thick, leaving the remaining ones about ſix or eight inches aſunder each way, which will be room enough for the plants to ſtand for the firſt hoeing; the ſooner this is performed, when the plants have four leaves, the better they will thrive; but in the ſecond hoeing, which muſt be performed about a month after the firſt, they ſhould be cut up, ſo as that the remaining plants may ſtand fourteen or ſixteen inches diſtance, or more, eſpecially if they are deſigned for feeding of cattle; for where the plants are allowed a good diſtance, the roots will be proportionably large; ſo that what is loſt in in number, will be over-gained by their bulk, which is what I have often obferved. But in fuch places where they are fown for the ufe of the kitchen, they need not be left at a greater diftance than ten inches or a foot, becaufe large roots are not fo generally efteemed for the table.

It is not many years fince the practice of fowing turnips for feeding of cattle, has been of general ufe; how it happened that this improvement fhould have been fo long neglected in every part of Europe, is not eafy to determine, fince it is very plain, that this piece of hufbandy was known to the ancients. For Columella, in treating of the feveral kinds of vegetables which are proper for the field, recommends the cultivating rapa in plenty; becaufe, fays he, thofe roots which are not wanted for the table, will be eaten by the cattle: yet this plant was not much cultivated in the fields till within the laft fixty or feventy years; nor is the true method of cultivating turnips yet known, or at leaft not practifed, in fome of the diftant counties of England, at this time. For in many places the feed is fown with barley in the fpring, and thofe plants which come up, and live till the barley is cut, produce a little green for the fheep to pick up, but never have any roots. In other places, where the turnip feed is fown by itfelf, the method of hoeing them is not underftood; fo that weeds and turnips are permitted to grow together; and where the turnips come up thick in patches, they are never thinned, fo that they draw up to have long leaves, but never can have good roots, which is the principal part of the plant, therefore fhould be chiefly attended to.

The general method now practifed in England, for cultivating this plant in the fields, is the fame as is practifed by the farming gardeners, who fupply the London markets with thefe roots, and is the fame as before directed. But it is only within the compafs of a few years, that the country people have been acquainted with the method of hoeing them; fo that the farmers formerly employed gardeners, who had been bred up in the kitchen gardens, to perform this work; but it is now performed by many country labourers, by which means that practice is loft to the kitchen gardeners; the labourers doing it much cheaper.

There has alfo been another method practifed very lately, by fome very curious farmers, in cultivating of turnips, which is by fowing the feed in rows, with the drill-plough. In fome places the rows are fown three feet afunder, in others four, in fome five, and fome fix. The latter has been recommended by fome, as the moft proper diftance; and although the intervals are fo large, yet the crop produced on an acre has been much greater than upon the fame quantity of land, where the rows have been but half this diftance; and upon all the fields which have been tilled, the crops have greatly exceeded thofe which have been hand-hoed. The late lord vifcount Townfhend was at the expence of making the trial of thefe two different methods of hufbandry, with the greateft care, by equally dividing the fame fields into different lands, which were alternately fown in drills, and the intermediate lands in broad-caft. The latter were hoed by hand, in the common method, and the other cultivated by the hoeing-plough; and when the roots were fully grown, his lordfhip had an equal quantity of land, which had been fowed in the different methods, meafured, and the roots drawn up and weighed; thofe roots which had been cultivated by the plough, were fo much larger than the other, that the crop of one acre weighed a ton and half more than that of an acre in the other hufbandry.

But when the turnips are fown in drills, they will require to be hoed by hand, to feparate and cut out the plants, where they are too near together in the rows; as alfo to cut up the weeds between the plants, where the plough cannot reach them. If this is carefully performed, the ploughing of the intervals will encourage the growth of the roots, by thus ftirring of the ground, and make it much better prepared for the crop of barley, or whatever elfe is fown the following fpring. This method of culture may be fuppofed to be more expenfive than that commonly practifed, by thofe unacquainted with it; but thofe who have made trial of both, find the horfe-hoeing to be much the cheapeft, and by far the beft. For the country people, who are employed in hand-hoeing of turnips, are very apt to hurry over their work, fo that half the weeds are left growing, and the plants are feldom fingled out fo well as they fhould be; nor are they curious enough to diftinguifh the charlock, which is one of the moft common weeds in arable land, from the turnips; fo that about the middle of September, it is very common to fee the fields of turnips full of the yellow flowers of the charlock. Now, in the horfe-hoeing, all the weeds in the intervals will be entirely deftroyed; fo that if a few plants in the rows of turnips fhould be overlooked, they may be eafily drawn when they appear vifible, and by this method the land will be fooner and better cleaned from weeds.

The greateft evil which attends a crop of turnips, is that of their being deftroyed by the fly, which ufually happens foon after the plants come above-ground, or while they are in the feed leaf; for, after they have put out their rough leaves pretty ftrong, they will be paft this danger. This always happens in dry weather; fo that, if there fhould be rain when the turnips come up, they will grow fo faft, as to be in a few days out of danger from the fly; and it hath been found, that thofe, which have been fown in drills, have efcaped the fly much better than thofe fown in broad-caft; but, if foot is fown along the furface of each drill, it will be of great fervice to keep off the fly, and a fmall quantity of it will be fufficient for a large field, where the drills only are to be covered.

Another danger of the crops being deftroyed is from the caterpillars, which very often attack them, when they are grown fo large as to have fix or eight leaves on a plant. The fureft method of deftroying thefe infects, is to turn a large parcel of poultry into the field, which fhould be kept hungry, and turned early in the morning into the field; thefe fowls will foon devour the infects, and clear the turnips. To this evil the turnips, which are fown in drills, are not fo much expofed; for as the ground between the rows will be kept ftirred, the plants will be kept growing, fo will not be in danger of fuffering from thefe infects, for the parent infects never depofit their eggs upon any plants which are in health; but as foon as they are ftinted, they are immediately covered with the eggs of thefe infects; and this holds in general with vegetables as with animals, who are feldom attacked by vermin when they are in perfect health; whereas, when they become unhealthy, they are foon overfpread with them; fo that it is the difeafe which occafions the vermin, and not the vermin the difeafe, as is commonly imagined.

When the turnips are fown in drills, it will be the beft way to plough between every other row at firft, and fome time after to plough the alternate intervals, by which method the plants will receive more benefit from the often ftirring the ground than they would do, if all the intervals were hoed at one time; and plants will be in lefs danger of fuffering from the earth being thrown up too high on fome rows, while others may be left too bare of earth; but, when the earth has been thrown up on one fide of the drill, it may be turned down again foon after the next interval is ploughed. This alternate moving of the earth will prepare the ground very well for the fucceeding crop, and greatly improve the turnips; but, as the plough cannot well be drawn nearer to the drills than two or three inches, the remaining ground fhould be forked to loofen the parts, and make way for the fibres of the roots to ftrike out into the intervals; otherwife, if the land is ftrong, it will become fo hard in thofe places which are not ftirred, as to ftint the growth of the turnips. This may be done at a fmall expence; a good hand will perform a great deal of this work in a day, and, whoever will make the trial, will find their account in practifing it, efpecially on all ftrong land, where the turnips are much more liable to fuffer from the binding of the ground, than they will be on a loofe foil; but yet, in all forts of ground, it will be of great fervice to practife this.

When the ground is thus ftirred in every part, one ploughing will be fufficient, after the turnips are eaten, for the fowing of barley, or any other crop; fo that there will be an advantage in this, when the turnips are kept late on the ground, as will often be the cafe, efpecially when they are cultivated for feeding of ewes, becaufe it is often the middle of April before the ground will be cleared; for late

late feed in the ſpring, before the natural graſs comes up, is the moſt wanted, where numbers of ſheep or ewes are maintained, and one acre of turnips will afford more feed than fifty acres of the beſt paſture at that ſeaſon.

In Norfolk and ſome other counties they cultivate great quantities of turnips for feeding of black cattle, which turn to great advantage to their farms, for hereby they procure a good dreſſing for their land; ſo that they have extraordinary good crops of barley upon thoſe lands, which would not have been worth the ploughing, if it had not been thus huſbanded.

When the turnips are fed off the ground, the cattle ſhould not be ſuffered to run over too much of the ground; for, if they are not confined by hurdles to as much as is ſufficient for them one day, the cattle will ſpoil three times the quantity of turnips as they can eat, ſo that it is very bad huſbandry to give them too much room; therefore the hurdles ſhould be every day removed forward, and if the turnips are drawn out of the ground before the cattle or ſheep are turned into the new incloſure, there will be leſs waſte made, for they will then eat up the whole roots; whereas, if they are turned upon the turnips growing, they will ſcoop the roots, and leave the rinds, which being hollow, the urine of the ſheep will lodge in them; ſo that, when they are forked out of the ground, the ſheep will not eat any of thoſe roots which are thus tainted.

I cannot omit taking notice of a common miſtake, which has generally prevailed with perſons who have not been well informed to the contrary, which is in relation to the mutton which is fatted with turnips, moſt people believing it to be rank and ill taſted; whereas it is a known fact, that the beſt mutton this country affords is all fatted on turnips, and that rank mutton, whoſe fat is yellow, is what the low marſhy lands of Lincolnſhire, and other rank paſtures, produce.

In order to ſave good turnip ſeeds, you ſhould tranſplant ſome of the faireſt roots in February, placing them at leaſt two feet aſunder each way, obſerving to keep the ground clear from weeds, until the turnips have ſpread ſo as to cover the ground, when they will prevent the weeds from growing. When the pods are formed, you ſhould carefully guard them againſt the birds, otherwiſe they will devour it, eſpecially when it is near ripe; at which time you ſhould either ſhoot the birds as they alight upon the ſeed, or lay ſome bird-limed twigs upon it, whereby ſome of them will be caught; and, if they are permitted to remain ſome time, and afterwards turned looſe, they will prevent the birds from coming thither again for ſome time, as I have experienced. When the ſeed is ripe it ſhould be cut up, and ſpread to dry in the ſun; after which it may be threſhed out, and preſerved for uſe.

There have been many receipts for preventing the fly taking turnips, but few of them deſerve notice; therefore I ſhall only mention two or three which I have ſeen tried with ſucceſs. The firſt was ſteeping the ſeeds in water with flour of brimſtone mixed, ſo as to make it ſtrong of the brimſtone: another was ſteeping it in water with a quantity of the juice of horſe-aloes mixed, both which have been found of uſe. The ſowing of ſoot or tobacco duſt over the young plants, as ſoon as they appear above ground, has alſo been found very ſerviceable: in ſhort, whatever will add vigour to the young plants, will prevent their being deſtroyed by the fly, for thoſe never attack them, till they are ſtinted in their growth. *Miller's Gard. Dict.*

Mr. Liſle is inclined to think, that the beſt way to manage turnips, the ſeed of which, ſays he, is impatient of growth, and apt to burſt in too much wet, as alſo to corrupt, if the ground be ſo dry as only to give it a damp, but not wet enough to ſet it on growing, is, firſt to harrow the ground fine, after it has been brought to a perfect tilth by ploughing, then to roll it with a roller big enough to break the little clods, if any ſuch remain, and ſo let it lie till the next rain; then, the ground being mellow, to ſow the ſeed, and harrow it in with ſhort-tined harrows, which may not open the ground too deep, nor bury the ſeed; then roll it again with a one-horſe roller, in order to keep the moiſture in the ground as deep as the ſeed may be: for the ſurface of the earth muſt not be dried before the ſeed can ſtrike root, which may be in twice twenty-four hours; and yet that ſurface muſt be ſo fine, and ſo lightly compreſſed, that the ſeed may ſpear through it. He takes the myſtery, as he calls it, of the ſucceſs or miſcarriage of a crop of turnips to conſiſt in theſe four things, viz. firſt, in the ſeeds not lying too deep; ſecondly, in its not lying too wet, which it cannot eaſily do if harrowed in ſhallow, for the ſurface of the earth is ſoon dry; thirdly, in its not lying too dry; and fourthly, in its lying in a fine bed. In another place, he tells us, that his gardener affirmed to him, that he had found turnip ſeeds, which had been dropped by accident and covered over with earth in digging, freſh and good a year after, when the earth was turned back again, and that it has then grown and produced good turnips. The reaſon is, that every ſeed which is buried ſo deep as not to be affected by the changes in the air, may remain in a ſound ſtate, and in a fit condition to vegetate, for many years, as hath been evinced by numbers of inſtances.

Mr. Duhamel adviſes after the two firſt hoeings a ſlight ploughing all over the field, with a plough that has no fins to the ſhare, as a ſpeedier and cheaper way to thin the plants: the turnips will not require any farther care. They will have attained their full ſize in October, before the froſts come, and ſhould then be taken up, ſtripped of their leaves, which may be given to cattle, and laid upon hurdles in a dry place, with a layer of dry ſand between each layer of turnips, which may be thus piled up, and which will keep very well in this condition, for the food of cattle during the winter. In Norfolk, they ſtow them in their barns, when intended for fattening of bullocks.

A dry ſeaſon is the beſt for hoeing turnips, becauſe neither the weeds nor the turnips hoed up then will be ſo apt to grow again: and Mr. Liſle ſuppoſes that care ſhould be taken to hoe up thoſe that are deepeſt rooted in the earth, and to leave thoſe that grow upon, and almoſt out of it, without much regarding their ſize; becauſe thoſe which lie on the ground, and have room to grow, will ſoon become the largeſt.

Some ſow turnips on their flax and hemp grounds, at the ſame time as they pluck up thoſe plants, and the ſeed is pretty well buried by the ſtirring thereby given to the earth. Others give their corn ſtubble only a ſlight plowing after harveſt, then ſow the turnips very thin, and harrow in the ſeed. Theſe methods do very well when the ground is in good tilth. Others again, ſow late turnips, merely for the ſake of their leaves, which they uſe as green feed, when they are about a foot high; and in this caſe they ſow the ſeed very thick.

An eaſy way to have two growths of turnips in the ſame field, is to ſow ſeed of the laſt gathering, and ſeed that is two years old; for this laſt is longer before it riſes, than the new: and an advantage attending this method, is, that the turnips, by riſing at different times, will have the better chance to eſcape the fly, or grub, which ſometimes deſtroy them entirely: for it has been obſerved, that theſe flies often come ſuddenly in great ſwarms, and eat up the turnips as faſt as they riſe; and that they ſometimes diſappear as ſuddenly; ſo that the turnips which riſe a few days after, in a neighbouring field, are not at all injured by them: conſequently, when the turnips of the ſame field riſe at different times, one or other may eſcape the ravage of theſe inſects; for they deſtroy them only while in their ſeed leaf.

The worm to which turnips are very liable may be guarded againſt, at leaſt in a great meaſure, as Mr. Liſle informs us, by liming the ground. This will alſo render them much ſweeter than they would otherwiſe be: and we are of opinion that freſh ſlaked lime ſtrewed over the ground when the turnip ſeed is ſown, will contribute greatly to preſerve the young plants from the fly. It is to the worm lodged in the root of the turnip, perhaps engendered from the egg of the fly, that Mr. Liſle imputes the diſtemper or diſeaſe in turnips, which the Norfolk farmers call the hanbery; ſo named from a like diſtemper in a horſe's heel. It is a warty excreſcence, formed probably by this inſect, in the ſame manner as galls are formed upon the leaves of the oak. In ſome years it takes off whole crops, and the turnips never thrive after it has begun to grow in them.

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A gentleman, remarkable, among many other good qualities, for several excellent improvements which he has made in agriculture, tried with succefs the following experiment, to preferve turnips from the fly, and the better to fecure their growth. He fowed the feed in a nurfery, where there was leaft danger of flugs or the fly, and where they might eafily be watered in cafe of great drought, to make them grow the quicker. They remained in this nurfery, till they were large enough to be tranfplanted. By this means he gained fome weeks longer, to perfect his fallow, or give a thorough plowing to ground which had borne a crop that feafon. He tranfplanted his turnips into the field, and by planting them regularly at due diftances, greatly leffened the expence of hoeing; their regularity making it very eafy to deftroy the weeds from time to time, as they appeared.

In the fecond part of the memoirs of the Society of Berne for the year 1762, the reverend Mr. Bertrand, not fatisfied with even a fcrupulous difcharge of the duties of his clerical function, has inftructed his parifhioners, his country, and mankind, in the important fubject of agriculture. The improving of light foils by the culture of turnips, is one of his objects: upon which he very judicioufly obferves, that though it be right to plough ftiff lands before the winter, in order to their being mellowed by the froft; yet as the fineft and beft parts of the foil will be in danger of being wafhed off, or carried down into the loofe earth underneath, when this is done in a light ground, or in mould which has a fandy or gravelly bottom; it will be moft adviseable here, to turn the ftubble down immediately after the corn has been taken off, and then to fow turnips; becaufe their fpreading leaves will fhelter and fecure the fine mould upon the furface, and keep the land in good heart, whilft the earth will be loofened and divided by their roots, fo that it will be rather fitter for a fpring crop, than if it had lain uncultivated.

The chief ufe of turnips is, to feed cattle in the winter and fpring, when there is a want of grafs for their pafture. Cows, oxen, and hogs, are very fond of this food, which fattens them, and increafes the milk of the former. Sheep too eat it readily, and thrive upon it, when they have been ufed to it early; but they do not relifh it when it has not been offered them till they are grown old: however, if they are kept fafting two or three days, moft of them take to it, and when they have once tafted it, they become very fond of, and feed kindly upon it. In fome places, they feed their lambs with turnips till the middle of April, though they then begin to run up to feed. Farmers choofe rather to do this, than to let them hurt their clover, fainfoin, lucerne, &c. Some parboil them a little, at firft, till their cattle, and particularly their fheep, are accuftomed to them: but a lamb only three weeks old, will, after it has once eaten of this food, fcoop out a raw turnip with great glee.

Turnips, if not clean eaten, and well cleared off the ground, may take root again, run to feed, and do great damage to the enfuing crop. Mr. Lifle inftances it in a gentleman of Berkfhire, who plowed up a turnip field in the fpring, and fowed it with peas: but the little dwarf turnips that were left behind, uneaten, notwithftanding his plowing them up, took root again, run to feed in great quantities, and did much damage to his crop of peas.

The practice of turning a flock of fheep, at random, into a large field of turnips, is very bad: for they will then fpoil more in a fortnight, than would keep them a whole winter. The beft way, therefore, of feeding them with thefe roots, is, as Mr. Tull advifes, and after him M. Duhamel, one or other of the three following methods, which are equally applicable to the drill, and to the common hufbandry.

The firft is, to portion out the turnip ground, by inclofing with hurdles fo much only as the fheep can clear in one day; and fo to advance the folds farther into the field every morning, until all be fpent. But it is to be obferved, that the fheep never eat them clean this way, but take only the leaves and the heart of the turnip: fo that great part of them remains in the earth. It is true that thefe fragments, if left there, rot, and become a manure: but when they are wanted for the food of the flock, and are to that end pulled up with iron crooks or forks made for this purpofe, the fheep do not relifh, and confequently eat but little of, thefe then dirty withered remains, tainted with their urine, dung, &c. nor can they nourifh them fo well as roots which are frefh and cleanly.

The fecond method differs from the former only in pulling up the turnips fo far as they are hurdled off, before the fheep are turned in. They then eat them better, becaufe the food is frefh and in good condition. Befides, as the whole turnips are pulled up more eafily than their pieces can be, there is not fuch wafte as in the other way. The turnips which grow next to the hurdles fhould be thrown towards the middle of the fpace hurdled off; becaufe they will be lefs liable to be trampled upon and fpoiled there, than nearer to the hurdle, where the fheep run about moft, in fearch of means, of efcaping into the open field.

The third way is to pull up the turnips, and carry them into fome other ground, and there fpread them every day on a new place, where the fheep will eat them up clean. This is done when there is land not far off, which has more need of dung than that where the turnips grow. The expence of carrying the turnips is compenfated by faving the price, or at leaft the carriage and removing of the hurdles: only when the turnips are laid on a fpot of grafs, as is frequently done in wet weather, the benefit of the dung and urine of the fheep is loft.

This method is requifite when the field on which the turnips grow is wet; becaufe, 1. The fheep would trample upon, and bury, part of the turnips, which would be loft. 2. In treading that wet earth, they would poach it, and render it unfit for corn. 3. By this means, a field may be dunged, as we have juft obferved, which wants it more than that where the turnips grew. 4. This muft neceffarily be done, if wheat has been fown in the alleys between the rows of turnips, according to the principles of the new hufbandry.

Turnips are always carried off the field, when they are intended to fatten the larger forts of cattle: and they fhould be cut in pieces for them, left they choak themfelves with the whole ones. They are given morning and evening to ftall-fed cattle, which in the intervals, eat likewife common fodder; but the turnips increafe their appetite to fuch a degree, that a middle fized bullock, ftalled for fattening, will confume near two hundred pounds weight of thefe roots in twenty-four hours, befides hay: whereas, if nothing but hay were given him, he would hardly eat half the quantity that he will with the turnips. A healthy bullock, in only good plight at the time of his beginning to be fed with turnips, will be very well fattened in three months.

Mr. Tull fays he found by experience, that the beft way of fowing turnips is in fingle rows, fix feet afunder. He fowed them in double rows alfo at that diftance, but they did not do well: and he likewife fowed them in fingle rows, with intervals of only three feet. Thefe laft yielded a greater crop than a neighbouring field, which was fown and managed in the common way: but neither the fingle rows three feet afunder, nor the double rows with intermediate diftances of fix feet, yielded, fays he, half fo much, as the fingle rows fix feet afunder: from whence he concludes, that it is beft to leave a fpace of fix feet between the rows; for that, if the alleys are well plowed, thefe turnips will thrive wonderfully, even though no other moifture falls but the dew, which will fink into the earth, to their roots.

However, notwithftanding Mr. Tull's experiment, M. Duhamel is for fowing turnips in double rows, if the intervals are of fix feet; or if they are fown in fingle rows, he would have thefe rows be but four feet afunder, which is the fpace left between the rows of vines in Languedoc, and which is there plowed with oxen.

An ounce of feed will fow as much land when drilled, as a pound will in the common way: and if care be taken to diftribute only the neceffary quantity, a great deal of trouble will be faved in the hoeing of the plants, afterwards, to thin them. But it is effential to obferve, we muft again repeat it, that all roots, whether turnips, carrots, parfneps, parfley, or any other, always thrive beft where there is a great depth of fine, light, well loofened mould. M. Duhamel trenched the whole of his kitchen-garden three feet deep: all his pot-herbs grew very fine, and his roots in particular were of a furprizing fize.

Mr.

Mr. Tull, by drilling his turnip feeds alternately at different depths in the earth, was fure to fucceed in one part or other, whether the feafon was wet or dry. If wet, the feed flightly covered fprouted firft; and in dry feafons, that which lay deepeft was the firft that rofe. By this means, and by mixing the feed, half new and half old, for the new always comes up fooneft, he had four comings up, which, as he obferves, gave the plants fo many chances to efcape the fly.

If one was fure of having rain immediately after the turnips are fown, it would undoubtedly be right to fow them very fhallow: but if no rain happens, they are beft deeper in the earth, becaufe they there meet with moifture fufficient to make them grow.

When the feafon has been fo kindly that all the feeds have grown, and the plants have not fuffered by the fly or other infects, they muft be thinned early, that the ground may not be exhaufted by fuch as are not intended to remain; for thofe that are left fhould be about a foot afunder.

When the turnips fown in drills thrive well, only each alternate alley need be hoed at one time, and the others a few days after; it being better to feed the plants gradually, by dividing the hoeings in this manner, than to give them a great deal of food at once, by hoeing all the alleys together, and afterwards leave them double the time without any culture at all. Another advantage attending this method is, that the plants will be the lefs liable to be killed by hot dry weather, and the lefs apt to be damaged by heavy rains. But it will not, indeed, fo effectually deftroy weeds, which ought always to be a principal object of the hufbandman's care, and which ever is one of the chief intentions of the New Hufbandry. However, as all weeds are very apparent in the alleys, it is eafy to extirpate them there; and as to thofe which may chance to be in the rows, the perfon who thins the turnips may cut them up at the fame time. He will there moft eafily diftinguifh the charlock from the turnips, efpecially when the leaves of thefe laft are come to be about the breadth of a half crown.

All plants fown in fingle rows are greatly benefited by the alternate hoeing of the alleys between them: for, as M. Duhamel obferves, 1. Four of thefe hoeings, which coft no more than two entire ones, are almoft as beneficial to the plants as four complete hoeings. 2. A plant which finds a great deal of nourifhment on one fide, is the better able to thrive without receiving fo much on the other. 3. If, in hoeing very near the plant, fome of its roots are broke; thofe on the other fide, not hoed, fupply the wants of the plant, till the broken ones have made frefh fhoots. 4. The horfe-hoe may therefore be brought very near to the turnips, without fear of hurting them; provided it do not force them out of the earth. 5. When a farmer has a great quantity of turnips to hoe, they are fooner fupplied by this culture, than they poffibly could be if all the alleys were to be hoed.

A furrow fhould not be left open near the turnips, while they are young; becaufe the earth about them would in that cafe become too dry: but there is no danger of this in the autumn, when they are grown ftrong, and the earth is moift. Neither is it adviseable to leave a furrow open near them during the winter; becaufe they would be in danger of being hurt by the froft.

When thefe plants are grown large, and their roots are confequently pretty well extended, the hoe-plough need not come quite fo near them as at firft: nor is it neceffary to hoe them at all, till they are about the bignefs of one's finger's end.

One alternate hoeing, or which is the fame thing, two half hoeings, will be fufficient when the turnips are fown late. But when they are fown early, and many weeds grow, one hoeing will not be enough.

By following this culture, M. Duhamel has feen turnips which weighed from fixteen to nineteen pounds; and we may depend on their weighing one with another twelve pounds a-piece in a good foil, which is a vaft produce from an acre of land. Mr. Miller fays, that one acre of turnips, thus properly cultivated, will afford more feed for fheep or ewes in the winter, than fifty acres of the beft pafture at that feafon.

Another vaft advantage which attends the fowing of turnips in rows, is, that inftead of occupying the whole ground when it fhould be fowed with wheat, and fometimes even when it fhould be fowed with fpring-corn, as is frequently the cafe in the old way; they are no hindrance to either in the New Hufbandry: for as the alleys are in good tilth, three rows of corn may be fown, feven inches afunder, between the rows of turnips; and when thefe roots are pulled up, the ground where they grew is hoed, and becomes the alleys between the beds of corn.

The beft turnip feeds are obtained from the largeft roots, which may either be tranfplanted for that purpofe, or marked out in the field where they were fown. Thofe which are commonly fold in the fhops, feldom produce the fineft plants.

Experiments on turnips cultivated according to the New Hufbandry.

In 1754, M. de Chateauvieux fowed turnips on beds, in two rows. They fuffered greatly for want of rain, and none of them grew to the fize they would have done in a more favourable feafon. Some of them weighed eight pounds; but their general weight was from three to four.

In 1755, M. de Chateauvieux fowed fome beds with one row, fome with two, and others with three rows. They were afterwards thinned, fo that the plants ftood a foot afunder in the rows. Thofe fown in one row were the largeft, and, in general, the moft equal. Some of them weighed fourteen pounds, and moft of them from feven to eight. In the other rows, they did not weigh fo much; but they were more numerous.

In confequence of thefe experiments, M. Duhamel, to whom they were communicated, makes the following ftriking calculation relative to the quantity of food which turnips will afford for cattle.

"Let a fquare whofe fide is 216 feet be formed into beds four feet wide, which is fufficient for one row of turnips. Thefe will be 216 feet long, and confequently will contain that number of turnips, planted a foot afunder. Thefe 216 multiplied by 54, the number of beds, will give 11664 turnips for the product of the fquare; and thefe multiplied by fix, the fuppofed weight of each turnip, will give 69,984 pounds for the weight of all the turnips on this fpot."

This may be looked upon as a very confiderable crop; for it will be fufficient to ftall-feed four bullocks during the three winter months, at the daily allowance of 200 pounds each: and yet there is reafon to believe that the quantity will be doubled in a good year, as will be pretty evident to thofe who confider at how low a rate the medium weight of the turnips is here eftimated.

In 1755, M. Duhamel fowed turnips in a field, on beds cultivated with the horfe-hoe. They grew extremely fine; many of them being twenty-nine inches circumference.

The following account of the advantages of the drill hufbandry in the culture of turnips, was fent by Mr. Willy, of South-Petherton, to the fociety for the Encouragement of Arts, &c.

The generous method you have taken to promote ufeful knowledge muft give every lover of his country the greateft pleafure, and incline him to do all in his power to increafe it; 'tis with this view, and by the perfuafion of many friends, I prefume to lay before you the following lines, hoping they may give you fome fatisfaction in refpect to the difference betwixt the Old and New Hufbandry.

I began hufbandry in the year 1742, had always an inclination to drilling, and was at much trouble and expence in getting one inftrument after another made for the purpofe; but was often difappointed, and for fome years was forced to lay by the thoughts of it. About eight years fince a gentleman lent me Mr. Tull's treatife; I then got fome new inftruments made, which fowed very regularly, and fince that time have fowed all my corn in rows. Several clofes I ploughed in fix furrow ridges, and fowed with three rows of wheat, ploughing the intervals with a fmall full, drawn by one horfe, and made it fit for wheat the next year; it generally took one third of the common quantity of feed, and in two years it yielded more than half as much again as the beſt crops in the common way did in one year; which, conſidering the ſmall expence of feed and labour, was ſome advantage, though not very great; but then it left the ground in very good order for the next crop of ſpring corn. I kept one cloſe, about two acres, four years to wheat in the ſame method; but the two laſt years did not anſwer to the two firſt, which makes me think Mr. Tull wrong, when he ſays, that plants of different natures are nouriſhed by the ſame ſort of food. I could give an account of the exact quantity produced in each year, but it would be tedious: upon the whole, I believe this method of ſowing wheat will be of no advantage except in poor ſtrong clays, where I apprehend it muſt exceed all others. But there are a few inconveniencies attending it; frequent ploughing the intervals is apt to make the wheat ſhoot freſh ears, which do not ripen with the others; and if any of the full ears when near ripe do but touch the freſh ploughed earth, ever ſo little wet will make them ſprout, and theſe will injure the whole crop; and I find it impoſſible to keep all up, as the rows are at ſo great a diſtance. But my method of drilling in the open fields, and which I intend to follow, is to put five rows about eight inches apart, on a ridge about five feet in breadth. This takes but two-thirds of the feed ſowed in the common way, and has always produced a better crop than the lands on each ſide of mine; this my neighbours are now convinced of, and ſeveral of them have drilled their wheat this ſeaſon: our ſoil, for the moſt part, is a deep heavy ſand.

I apprehend the principal advantage in drilling wheat is placing it at a proper depth, which I think is within two inches or thereabouts. I have obſerved, that the firſt motion of the wheat is by ſome roots, which in a little time run very deep; then it ſhoots up its blade; next it begins to form a head, about an inch under ground, from which come (very ſoon in a mild ſeaſon) the ſecond and third blades; and after this it begins to ſhoot freſh roots and branches from this ſame head, till in time it grows very large, eſpecially in a fruitful ſoil and a good ſeaſon; and it keeps on ſhooting freſh roots all the growing ſeaſon: now if the corn is too deep, and a ſevere froſt happens while this head is forming, the plant is quite deſtroyed: but if it lies ſhallow it ſhoots a new blade from the corn, and goes on in its operations as before; this was the caſe in 1763, a ſevere froſt happened in the night of the thirteenth of February, which deſtroyed a good deal of wheat; ſo that ſome which lay deepeſt was ploughed up, and ſown with other feed in the ſpring. Laſt year multitudes of plants were killed in the ſame manner, and brought the crop very thin. In ſhort, I am very certain, that whoever will make their obſervations will find that what I have ſaid is the truth; that the ſhalloweſt corn will flouriſh ſooner and better, and from thence will be led to ſee the advantage of drilling wheat.

But although I intend leaving Mr. Tull's method of ſowing wheat, yet I hope always to follow it in beans and turnips.

My beans I have ſown theſe four years in double rows, about ten inches a part, and about two feet intervals. Theſe I plough from and to the beans, when about ſix inches high; this is done with a little ſull drawn by one horſe, and will plough three acres in a day. This method hath ſucceeded ſo well, that many are come into it; although the farmers have always an averſion to new methods of managing; we ſow but one-third of the feed, and have a much better crop, as is allowed by all.

As for turnips, all my neighbours will allow the drill to beat every thing. I ſow a double row about eight inches wide, on a ridge about five feet, and though I did not ſow this year till Auguſt, I have turnips two feet round, after wheat. I have given them but one ploughing as yet, beſides hoeing them out at proper diſtances. I believe all will acknowledge I have double the crop in weight with any ſown in the old way. I left four intervals unploughed in one cloſe, to ſee the difference, and it is very ſurpriſing. One of my neighbours was prevailed on to ſow a few rows in a piece he was ſowing, and let my man plough them. The difference is ſo great that he is become an advocate for the drill huſbandry; indeed I do believe that it will ſoon make its way through all the prejudices of the old farmers to the contrary; eſpecially as we have a drill invented by an ingenious carpenter, with which ſeveral farmers have ſown beans, peaſe, turnips and wheat, and it anſwers exceedingly.

For theſe ſeventeen or eighteen years paſt, I have been ſtriving to improve a crop of turnips. Before this, nothing was known or aimed at hereabouts, but ſowing in the common way, one pound of feed on an acre; and then come thick, come thin, weeds and all grew together, till the ſheep were turned in to eat the crop as it was, and generally it was very poor.

The firſt improvement I made was by Ellis's direction, to drag them well with heavy harrows till they were got pretty thin, by which method I ſoon got better crops than any about me. But then I ſowed double the quantity of feed, that I might have ſufficient ſtock of plants for my after huſbandry. My neighbours were ſoon convinced of the advantage of this, and followed my example, which is now the common practice. After this, finding the thinneſt was beſt, I got ſome hoed: this I found ſtill better, but very expenſive, our people not being uſed to it. I tried Mr. Ellis's receipt to prevent the fly from deſtroying the young plants, but my ploughmen refuſed to ſow the feed when mixed with ſulphur. I then invented a long box, made full of holes, for the feed to fall through, and faſtened it to two wheels ſo as to keep it above ground; this went ſo light that a boy could draw it, and ſowed the feed very regularly. I ſhewed this to a friend of mine, (Mr. Joſeph Pittfield, of Sidland in Dorſet) who had one made immediately; and ſoon made an improvement on it, by having the holes made in rows about a foot aſunder. Finding that the plants could be thinned and cleared at a much leſs expence, I followed this method of ſowing for myſelf, as did ſome of my neighbours, for ſome years, and with a deal of ſatisfaction. A few years ſince, I was willing to try what ſtirring the ground deeper would do; and being reſolved to try the drill huſbandry in corn likewiſe, I had a ſmall ſull made, with which one horſe will plough more than two acres in a day, firſt turning four or five inches deep from the plants, and then back to them again: we generally ſow turnips after wheat, peaſe, and flax, and my method is to plough the ground into ſix furrow ridges, which with the open furrow makes about five feet in breadth. On ſuch a ridge I ſow (out of a ſhort box) two rows of feed, though ſometimes but one, and harrow it in with a very light harrow. When they have four or five leaves I get them thinned, and give them a ploughing; and ſome time after, when they begin to kern, I have them thinned and cleaned again: and this is all the huſbandry I have hitherto beſtowed, and all I think is neceſſary, as we do not ſow till late; the coſt of which is about three ſhillings *per* acre.

I have ſown ſome betwixt rows of beans, and they anſwered very well: when the beans were pulled, I had the plants thinned and cleaned, and the earth ploughed betwixt the rows.

The firſt I ſowed laſt year was a ſmall piece about half an acre, where hemp failed: I had the ground ridged up, and ſowed with two rows of feed, and managed, as I ſaid before: indeed the ground was dunged for the hemp. This was ſown the latter end of July, but did not come up till the middle of Auguſt, for the want of rain. I pulled them before Chriſtmas, and had fifteen putt loads, which every one will acknowledge to be a good crop; I believe double a common one: and though the rows were four feet apart, the leaves touched each other. The next I ſowed was after wheat, about the middle of Auguſt: when the wheat was carried off, I had the ground ploughed into ridges where the old furrows were, and ſowed one row of feed on each ridge: theſe coſt but little in thinning and cleaning, and once ploughing, and were a very good crop: the largeſt of them was more than two feet round, and weighed above ſix pounds; indeed towards the hedges they were much ſmaller; I had fifteen putt loads per acre, though the ground had borne three crops ſince it was dunged. Another piece of two acres I ſowed after peaſe, in double rows; but not till the latter end of Auguſt: I had the ground ridged up, and when the plants were fit, I had them thinned and cleaned as uſual, but left four ridges for ploughing to ſee the difference; and truly it was ſurprizing: thoſe that were ploughed were more than three times as large,

large, though they had all the same husbandry, except ploughing. They are as good a crop as the wheat stubble, though sown later, which makes me think double rows are best: our soil is mostly heavy good sand.

We have reserved for this article the following account of several very important experiments made by Mr. John-Wynn Baker, under the direction of the Dublin Society, and published at their request, on the culture of cabbages, the turnip-cabbage, boorcole, and turnips, by various methods; with an accurate state of the produce; and of the absolute and comparative advantages of each in feeding sheep and horned cattle. *See the articles* BOORCOLE, CABBAGE, POTATOES, and TURNIP-CABBAGE.

In the month of March, 1763, two acres of ground, very highly manured with dung, were planted with potatoes, in the manner usually practised in this kingdom, with spade and shovel; in the beginning of November following the potatoes were dug. The land being low, and the winter very wet, it could not be plowed until the beginning of March, 1764; when, it should be observed, the under stratum, upon which the dung and potatoes lay, rose at the plowing as stubborn and strong, as if no part of the ground had been tilled before: which proves the potatoe tillage, in the manner in which it is usually practised, not to be so beneficial to land as is generally imagined: the fact being, that only about thirty inches in every nine feet of the ground is tilled at all.

In the night of the 10th, and on the 11th and 12th, of May following, there was very fine rain; this rain enabled me, on the 12th, to reduce this stubborn ground pretty fine by the harrow.

In the month of March, 1763, the other part of this field was broke for fallow (an improper time to break fallows; but, my entrance upon the farm in that month was the cause); in June following it was cross-ploughed, which brought it into very large lumps; from the position this ploughing threw them into, they were exposed, in a greater number of points, to the influence of the weather, than the ground would have been, had the second ploughing been in the same direction as the first.

In this situation I left this fallow till the March following; when, it was ploughed for the third time, with the potatoe ground, in the same direction as at first; by this third ploughing this land was brought into an exceeding fine tilth.

This benefit arose from the ground not having been harrowed at all. This is something contrary to the common mode of culture; but was adapted to the species of ground I had to work upon; which I shall describe hereafter.

What the harrow would have done in part towards reducing it after the second ploughing, was completely effected by the influence of the summer and winter; the first destroyed all the weeds and couch-grass (with the latter of which the ground abounded); and the lumps exfoliating by the operation of the winter, by degrees fell into fine mold; whereas, had it been harrowed before the winter, the rains would have run the smaller particles together, so as to have given a great adhesion to the ground before the spring; abstracted from the like mischief, which the cattle would have done by drawing the harrow. In the beginning of June, I ploughed this part of the field a fourth time, and the potatoe ground a second; by which ploughing I laid the whole field into ridges of five feet width, except about half an acre, which I reserved for other purposes, as will appear hereafter.

In this field I had two parcels of manure ready prepared for it. One consisted of earth raised from the head-land, mixed with lime, which lay about twelve months, having been in that time twice turned.

The other parcel consisted of the like earth, and lime, mixed in the same manner, after which I mixed dung with it, *stratum super stratum*, which lay about two months, when I turned it: after which it lay about two months longer: by this stirring the ingredients, of which this parcel was composed, were perfectly incorporated with each other; and a new putrefactive fermentation was excited in it; which perfectly prepared it for the land: and all the earth was so fully impregnated with the juices of the dung, that it was very little, if any thing, inferior to the dung: whereas, when dung lies by itself, great part of the volatile saline particles are lost, as soon as the fermentation begins; some fly off in vapours, and others run off with the juices of the dung and rain, which fall upon it.

When I have mixed dung and earth, in the manner already described, I always once, or twice when the season affords it, cover the compost with a large quantity of snow, or ice; which, upon dissolving in its passage through the whole, causeth the earth to be finely impregnated by the dung. Snow, by being gathered with shovels or rolled together in balls, is longer dissolving than ice, and therefore I prefer it, unless it be ice of water which happens to be the soakage of a dung-yard, such ice being always replete with food for vegetables.

The land being now, in June, in five feet ridges, in the manner already described, I began to draw out my compost; which I disposed in the following manner: I drove the cars up every alternate ridge, and upon each of them dropped the compost, till I had manured about three acres of the fallow ground; then, with shovels, I divided this manure, as equally as could be, in every furrow; which was readily done, from the convenient manner in which it was deposited.

In the same manner I put out the other parcel of manure (which, it may be remembered, I before said consisted of lime, and earth) upon an acre and a half of the potatoe ground; and on a part of the fallow ground, where no compost, or other manure, had been put; and spread it in the same manner as the former.

The whole field being thus manured, I ploughed it again, which was the fifth ploughing of the fallow, and third of the potatoe ground: by this ploughing I altered the position of every ridge, by laying the middle of each exactly over the manure; consequently the furrows were made, where the middle of the ridges was before.

The half acre before-mentioned I manured with at least double the proportion of compost, which was allowed to the other part of the fallow; as it was flat, and it was necessary to manure every part of it, being intended for turnips, to be sown in the promiscuous way.

To this piece of ground I gave a sixth ploughing; as it could not have the benefit of the horse-hoe, when cropped, and therefore I thought it necessary to reduce it as fine as possible, in order to give the broad-cast crop of turnips every advantage I could.

The field being prepared in the manner already described, I proceeded to crop the land in the following order.

July the sixth and seventh, I planted one row of cabbage plants, upon the middle of every ridge, of about an acre of the fallow ground, the plants in the rows two feet from each other. In like manner I planted about half an acre with turnip-cabbage plants.

Hence it may be observed, that the plants were in rows five feet asunder, and two feet asunder in the rows.

This business ought to have been done, at least, a month sooner; but I could not get the ground ready in due time; however, the success of these crops may encourage others not to give up their expectations, although they may happen to be as late as I was, which must frequently happen in a course of business; though this is always to be avoided as much as possible.

I never begin to put my plants out till about six o'clock in an evening, unless I can be ready for planting in a rainy day, which is always to be preferred; in the other case, I always keep the men at this work as long as they can see. If it can be done in, or immediately after, rain, that will save the expence of watering the plants; which is an object worthy of attention in a large work of this kind; besides the circumstance of the plants succeeding much better.

On Friday the sixth of July we had fine rain, and on the seventh I finished. On the eleventh we had some light showers, and on the twelfth fine rain, which secured life to my plants; but they began to look sickly before the twelfth; three of the intervening days having been hot and dry.

On the seventh I also planted three of the five-feet ridges, with one row of boorcole plants on each ridge, the plants in the rows two feet asunder.

Be it observed, that, for the obtaining large cabbages of the spring sowing, the seed ought to be sown early in March;

March; and, if once planted out before the final planting them, it will be an advantage to the crop: the case is the same with respect to turnip cabbage; but it is more essentially necessary in the common way of raising cabbages; for, otherwise, they will run into long shanks, and will not cabbage well; most gardeners allowing their plants too little room: that is not the case here; my cabbage and turnip-cabbage seeds were not sown till the twenty-sixth of March, and I was so much hurried, that I never had time to get them planted out before the final planting, save about three thousand plants; and yet they are all very short in their shanks. This may justly be attributed to the manner of disposing them, and the culture they receive in this husbandry.

Here I cannot omit to remark one circumstance, for the observation of gentlemen and farmers who may adopt this husbandry, viz. That I have not one cabbage this year of the sort I intended to have; what I have being chiefly sugar-loaf, the seedsman having deceived me; and, if I had not happened to have about an ounce of turnip-cabbage seed by me four years old, I should not have had one plant of that kind this year; the seed, which I bought in Dublin for it, turning out a poor, small, wretched cabbage.

I shall now proceed to make my report of the farther treatment, and success, of these crops, before I proceed to the turnips, &c.

Upon the 17th of August, I horse-hoed my cabbage, turnip-cabbage, and boorcole, for the first time, by taking off, at one furrow of the plough, only one side of each ridge, close to the plants: thus they remained till the 25th, when, I ran the plough in the same furrow; by which, with the first furrow, I plowed about twenty-one inches deep. This being finished, I immediately returned the earth back to the plants; this afforded them fresh nourishment; and in order to give their roots time to penetrate this fresh earth, which, by the horse-hoeing, was become very fine mould, I let them remain in this state till the twelfth of September; when, I horse-hoed them again, by taking off the other side of every ridge; and, on the twentieth, deepened the furrow in the same manner as the former, and immediately returned the mold back to the plants; and, on the eighteenth of October, threw up a small furrow to each side of every ridge, which finished the culture of these crops, and restored the ridges to the form in which they were when the plants were put out upon them.

The plants all grew very luxuriantly; and, in the hottest weather, were infinitely more brittle in their leaves, than any I could see in the gardens of my acquaintances: which is a certain indication of health in this kind of plants.

The horse-hoeing was so effectually destructive to weeds, that it cost me but four-pence to weed these crops, which occupied about an acre and three quarters of ground.

The repeated horse-hoeings cost me two shillings and four-pence an acre, for workmen's wages, exclusive of horses, of which I used two, and sometimes three.

December the 8th, I cut one row of the cabbages, they beginning to decay, which is indicated by their bursting. The number was two hundred and fifty-eight, and they weighed sixteen hundred-weight, three-quarters, and twenty-one pounds, *i. e.* one thousand eight hundred and ninety-seven pounds: which, at an average, is seven pounds and near six ounces for each cabbage.

The produce upon an acre, on weighing this row, which was five hundred and sixteen feet long, amounted to twenty-three tons, four hundred, two quarters and fourteen pounds, *i. e.* fifty-two thousand and thirty-eight pounds: which is, at least, from ten to seventeen tons less, as I compute, than the produce would have been upon an acre, had I obtained the sort I intended to have, which was the large, late, Dutch cabbage. However, such a produce as was here obtained, will be an ample reward for the labour any one may bestow in this husbandry, as will appear when I shall come presently to shew how many cattle twenty-three tons will maintain.

December the 17th, I took up one row of the turnip-cabbages, which were in number two hundred and forty-nine, they weighed eighteen hundred weight, and fifteen pounds, *i. e.* two thousand and thirty-one pounds, after chopping off the roots and stalks below the turnip, which ought not to be weighed, as being no part of the food for sheep, or cattle: the weight of these plants, one with another, was something more than eight pounds and two ounces; some few weighed fourteen and fifteen pounds. The produce upon an acre, on weighing this row, which was four hundred and ninety-eight feet long, amounted, at the same proportion, to twenty-five tons, fifteen hundred, three quarters and seven pounds, *i. e.* fifty-seven thousand seven hundred and sixty-one pounds.

This crop was much greater than ever I had before; and, from some observations I have made this year, I am inclined to believe, their culture may be improved to a produce of ten tons more upon an acre: but, abstracted from that, the produce already obtained is more valuable than any crop I know of, for they are invincible by the winter, either in or out of the ground. The great distress of even the careful farmer is in the months of March and April, for his ewes and lambs, when turnips are gone, or are but very indifferent food, and all other green winter-food is exhausted.

Feeding ewes upon dry hay affords but little milk to their lambs; add to that, hay is not made without great expence and anxiety, over and above the rent of the land; for really, where the farmer is so unfortunate as to have his hay upon hand in wet weather, it is a business which will exercise his patience, no less than it will consume his money.

One superior excellence in these plants is, that sheep will prefer them to turnips; another is, that they are a firmer and more substantial food: and, to ascertain their firmness in texture, and quality in keeping after being drawn, I have kept them near twelve months exposed to the open air, to the extremes of heat and cold, and, after that, they were found, save some few.

If any person who may cultivate this plant for sheep, should keep a large stock, he may let the plants remain in the ground till he wants them; in that case, he may turn the sheep into the field, where they will eat them quite down to the stems; and, as the plants stand naturally above the ground, and by my manner of cultivating them, they are still higher, by being placed on the tops of the ridges, the sheep cannot dirty them, as they do turnips when turned into the crops; add to this, that when the sheep have eaten all the leaves, and begin to eat the butts or turneps of this plant, they will not rot as turnips do, when wounded; but will certainly keep sound, even after that, for six weeks or two months: nay, yesterday, the fifteenth of February, upon dressing some of them for seed, I found some, which had been accidentally wounded by cows, upwards of three months ago, perfectly sound, notwithstanding the great quantity of rain which had fallen upon them.

When the leaves are wanted early in the winter for sheep, or black cattle, or, the land is wanting for any other crop; in either case the plants may be taken up, the leaves taken off, and the turnips thrown any where upon a piece of sound dry grass ground, where they will keep, and be ready for sheep in the spring: but this work is attended with some trouble and expence, the roots being very firm in the ground.

The latter end of December, and in January, the plants begin to throw out fresh shoots, which are to produce the seed; and, when they begin to do so, all the leaves of the preceding year fall off, being first greatly decayed; and as the leaves, in October and November, are really very numerous, and afford a large quantity of food for cattle, it is well worth the trouble to take them off before they begin to decay; and, when this is judiciously done, the trouble is very little.

The method which I would recommend is, that two men be sent into the field, each taking one row before him, and, as he pulls off the leaves, laying them upon the ridge between the turnips; when these two ridges are finished, or as many as may be thought necessary, let one horse, or more, be brought with a pair of cleeves upon his back; let him be placed in the furrow, between the two rows; and, as he passes along, the two men fill the cleeves, which may be most conveniently done, from such a disposition of the business, without any injury to the turnips in the rows.

Where extenſive crops of theſe plants are raiſed, it will be very uſeful to collect all the roots, whether left in the field by ſheep, or otherwiſe ſeparated, and mix them with heaps of earth, where a putrefactive fermentation will ſhortly commence, by which the earth will be ſtrongly impregnated with volatile and fixed ſalts, and will then be an excellent manure; and, indeed, all ſucculent vegetables will contribute to the ſame end, under the like treatment.

I muſt beg leave in this place juſt to mention, for the conſideration of the ſociety, and which I earneſtly recommend to be tried by mariners, another uſe, to which, I think, this plant, may be converted, which is ſtill of more importance, than any which I have yet named.

We loſe more men in the beginning of a war in the navy, as I have been informed by the navy-ſurgeons, by the ſcurvy, than by the enemy, which is attributed to their ſudden change of food. From freſh proviſions and vegetables on ſhore, the men are at once brought to ſalt proviſions.

The turnip of this plant, I am inclined to believe, would keep three or four months on ſhip-board, perhaps longer; but the navy-ſurgeons have told me, that if it would keep ſix weeks, it would ſave the lives of many men. Something has been ſaid on this ſubject before, in a pamphlet intitled, Hints on Huſbandry, in a letter to the Dublin ſociety, printed by Flinn, in Caſtle-ſtreet.

I cannot diſmiſs this ſubject, without earneſtly recommending the culture of this plant to the attention of the farmer, particularly to ſuch as keep any ſtock; and, although the plant is very little known, except in the gardens of the curious, yet, whoever will cultivate it in the way I have here ſet forth, will find himſelf amply repaid for his labour; for how comfortable is it, for a man's mind to be at eaſe about his flock, in the months of ſcarcity? Whereas I have every year obſerved, that the farmer's flock, particularly ewes and lambs, are turned into his meadows to live upon the ſpringing graſs, to the irrecoverable injury of the hay-harveſt; as frequently have I ſeen them upon young clover, to the manifeſt injury of that crop.

I could enlarge greatly upon theſe injudicious practices; but in brief I ſhall only ſay, that if I ſhall live to ſee the culture of this plant generally eſtabliſhed, I ſhall have the comfortable reward of knowing that I have been uſeful to mankind; a circumſtance which will be more grateful to me, than if I had conquered a nabob, or extirpated an Indian nation.

December the eighteenth, I cut two perches in length of one of the rows of boorcole, which contained twenty-one plants; they weighed one hundred and eighteen pounds, which is very near five pounds ten ounces for each plant: but I am inclined to believe, that theſe plants will ſucceed as well, if they are planted only eighteen inches aſunder in the rows. However, at the above proportion, there would be ſeventeen tons and fourteen hundred upon an acre. But, if the produce would be the ſame, were the plants only eighteen inches aſunder, in that caſe an acre would produce, by this culture, above twenty-three tons and twelve hundred.

This plant is well worthy the farmers or graziers attention, for, as faſt as it is cut, it will again, in about a month or ſix weeks, afford another crop: I have been cutting theſe plants for my family-uſe ever ſince the middle of Auguſt laſt; I believe ſome of them have been cut three times; and they are excellent for the table. For feeding cattle and ſheep they are highly valuable, as no froſt will injure them; and, although the firſt crop amounts not to as many pounds upon any given quantity of ground as the others, yet the ſucceeding crops will, I believe, make their produce nearly, or quite, of equal weight with any other of the cabbage kind. But I muſt not omit to obſerve, that, as theſe plants afford only open leaves, and many of them very ſmall, there will be a little more trouble in collecting and carrying them to the ſheep and cattle, than there will be with the other kinds.

It may not be improper to obſerve, likewiſe, that, upon the approach of the ſpring, when they begin to throw out their ſpring-ſhoots for ſeed, if the large leaves have not been taken off for winter uſe, they will decay and fall off in the ſame manner as the turnip-cabbage leaves have already been deſcribed to do.

I have not yet tried it, but I believe that the beſt way of uſing this plant, would be to allot one whole field to the culture of it, proportioned in ſize to the ſtock intended to conſume the produce; and in September or October, to turn the ewes into the field for a few hours, morning and evening, and then lodge them on any piece of graſs or fallow, which may want improvement, to which they will greatly contribute by emptying themſelves upon it; and thus continue turning them into the boorcole field, till they have eat all the luxuriant leaves; then let the plants reſt a month, and there will be another crop. By having two ſmall fields under this crop, a flock of ſtore-ſheep might be maintained a whole winter at a very ſmall expence; for whilſt the produce of one field would be conſuming, the other would be coming on.

This method occurred to me from an accident, which attended my boorcole this year. My cows got into the field, and preſently devoured ſome of the leaves of the plants; theſe plants have engaged my attention ever ſince, and I have the pleaſure to ſee them again in a very luxuriant ſtate.

If any perſon ſhould be able to put this ſcheme in practice before I can accompliſh it, I recommend it to them, not to let the ſheep paſture ſo long upon the crop, as to wound the ſtalks for want of leaves; as too great an injury to the ſtalks may check the ſucceeding growth; which injury, I am inclined to believe, will not happen to the plants, at leaſt not in ſo great a degree, whilſt they have a ſufficient quantity of leaves.

It doubtleſs will be obſerved, that I confine this ſcheme to ewes or ſtore-ſheep: my reaſon for that is, that fat ſheep ſhould always have as much food before them, as they may chooſe to eat; add to this, that ſheep, when they are fat, are more ſubject to be lame, than ſtore-ſheep, to which ploughed ground will greatly contribute.

We ſhall now return to the ſtate of the field, in which it was after being manured, and ploughed into ſmall ridges of five feet breadth, with the compoſt under them in the fallow part, and part of the fallow with the lime and earth, and the potatoe ground aided with the lime.

Upon the fourteenth of July, I ſowed with my drill plough what remained of the ridges of the fallow manured with the compoſt. That part of the fallow which was manured with the lime and earth, and that part of the potatoe ground which was before deſcribed to be in ridges, with turnips: and that part of the fallow before deſcribed to be flat, and manured with a double proportion of the compoſt, I ſowed in the promiſcuous way with turnips alſo.

The drilled turnips filled only one row along the middle of each ridge.

When the drilled turnips were about three inches high, I thinned them by hand, as being much preferable, and more expeditious than any inſtrument, intending to have them ſingled out to about one foot aſunder in the rows: but, it being ſo new a work, the women could not be brought to do it effectually at once, they apprehending, that the whole crop would be loſt, and urging, that they were ſure there was already too much ground allowed to one row: under theſe circumſtances, I could not get this work done quite to my mind this year, as I had, beſides this field, two others ſown in the ſame way, amounting in all to about twelve acres.

My turnips ſhould have been ſown at leaſt three weeks earlier; but the immoderate, and continual rains of the preceding winter, involved me ſo much with my ſpring-ſowing, that I could not accompliſh my turnip-ſowing earlier.

The turnips, after being thinned, received the horſe-hoeings much about the ſame time, and diſtances, as the cabbages; with this difference only, that I deepened the furrows of but a few ridges in another field by a ſecond ploughing in the ſame furrow, which I did not find to benefit the turnips much: for, if the ground be well prepared before the ſowing, the depth of one furrow will be enough for turnips, provided that be deep and bold.

Thinning the turnips in drills by hand coſt me eight-pence an acre; weeding of them coſt me four-pence; and the

the repeated horse-hoeings about fourteen-pence an acre for workmen's wages, exclusive of the horses, of which I generally used two, except in very hot days, and then I found three were necessary.

The broad-cast turnips were carefully thinned by hand, when they were about two inches high; which the women did with more courage than they did the drills; and sometime afterwards, I hand-hoed them once, and wed them twice.

Thinning them by hand cost me four shillings. Hoeing them afterwards cost eight shillings, and weeding them cost me two shillings and four-pence. They were scarcely half an acre; this expence being therefore doubled, they cost me at the rate of twenty-eight shillings and eight-pence an acre, over and above the extraordinary ploughing, and double proportion of manure.

In truth, this crop greatly exceeded my expectations, being by far the best I ever had in the broad-cast way; but I attribute their success wholly to the thinning them by hand; for two, three, four, and often more, turnips will be so united and interwoven, that it would be impossible for the most dextrous hoer to separate them; whereas the fingers and thumb will preserve the master plant, whilst the others are most conveniently drawn from it by the other hand of the person employed: add to this, that there is no labour in which we are more liable to be deceived, than turnip-hoeing.

In one of my other turnip fields I manured about an acre of ground with shell marle, which I sowed in drills with turnips in the same manner as the former, on the sixteenth of July.

In the same field, I manured about half an acre with the native earth, which had been exposed to the weather for upwards of two years, which I sowed likewise in drills with turnips on the sixteenth of July.

Both these crops were thinned by hand, and horse-hoed, in the same manner as the former.

Thus we have five experiments in the drill way upon turnips, with different manure. One with the compost already described, one with lime, one on potatoe ground, aided with lime, one with shell-marle, and one with native earth; and also one in the broad-cast way, with a double proportion of the compost, and an extraordinary ploughing.

The principal point to be determined by these experiments is, whether sowing turnips in drills, or the broad-cast way, will afford the heaviest crop: but the trials with the different manures will, I hope, be also useful.

The produce of drilled and broad-cast turnips compared.

December the seventeenth, I measured out three square perches of the best of the broad-cast turnips, and also three square perches of the drilled; and the produce was as follows:

The three perches of the broad-cast turnips weighed sixteen hundred weight and one quarter, i. e. one thousand eight hundred and twenty pounds; which, at the same proportion, amounts upon an acre to forty-three tons, five hundred weight, three quarters and six pounds, i. e. ninety-six thousand nine hundred and seventy pounds.

The three perches of drilled turnips weighed seventeen hundred weight, two quarters, and twenty-one pounds, i. e. one thousand nine hundred and eighty-one pounds; which, at the same proportion, amounts upon an acre to forty-seven tons, two hundred, three quarters, and two pounds, i. e. one hundred and five thousand five hundred and ninety pounds.

	T.	C.	Q.	lb.		Pounds
An acre of drilled turnips	47	2	3	2	or	105590
An acre of broad-cast ditto	43	5	3	6	or	96970
In favour of the drilled	3	16	3	14		8620

Thus we see, that, notwithstanding the extraordinary proportion of manure, and the extraordinary ploughing, which was afforded to the broad-cast turnips, the drilled crop, with intervals of five feet, produced the greatest quantity upon an acre, by three tons, sixteen hundred, three quarters, and fourteen pounds weight.

The drilled turnips in my other fields were very large, regular, and even crops, as many gentlemen saw during their growth.

Those sown on the acre manured with the shell-marle were very near as good as the rest—those sown on the potatoe ground were not near so large, but were regular—those sown on that part of the fallow-ground which was limed, were very poor crops—and those sown on the ground manured with the native earth were miserable.

The crops in my other fields were all treated in the same manner as that already described; except, that the fallows were broke in September, 1763, instead of March, 1763.

It now remains to describe the nature and quality of the land, and then to draw conclusions from the various experiments.

The land lies upon a lime-stone quarry, which is very near the surface; and is, naturally, a very strong and stubborn soil, with an infinite number of loose lime-stones in it. With dry winds, or a parching sun, the ground unites, and is as hard as bricks; moderately wet, it is reducible by instruments; but, when thorough wet, it runs together, and is like brick-clay when tempered. This, I repeat it, is the natural quality of the land, and is what the writers would call a barren, grey, stiff earth, but is not quite a clay.

I have found repeated tillage, when the land is in a proper state of moisture, will reduce it, and divest it of its natural adhesion. Tillage and manure together render it capable of producing any thing; as, I believe, such agents will do upon any land, provided it can be kept moderately dry. The fields, which I had under turnips and cabbages, have been in appearance all the summer a fine loam, and really bore the complexion of very fine land, abstracted from the rich appearance of the crops.

I recommend to the practice of all persons, who may have such land as this to work upon, never to harrow the fallows before winter, but as early as may be in the spring, and during the working the fallow in the summer, but not to leave more than one day's ploughing unharrowed, but rather harrow in the evening what has been ploughed in the morning, and then the harrow will reduce it; but if the ploughing is continued for two days, without any harrowing, the harrow will have no more effect upon the land, than it would have upon bricks, unless it be moistened with rain; in which case it will be reducible, as, it may be remembered, I described the potatoe ground to have been reduced, after rain which fell on the twelfth of May.

Conclusions to be drawn from the preceding experiments.

These experiments prove gardens to be no more than farms in miniature, under an extravagant expence of culture; since we can with the plow raise more tons of the larger kinds of garden vegetables for twenty shillings, than by the spade for as many pounds: and indeed, I do not see, why most of the small ones may not be raised in the same way.

They also prove, that it is profitable for the farmer to raise different species of cabbage for his cattle in winter; and I have it in contemplation to try them for summer use also. However, for the winter, it is an object of great importance, not only to the well-feeding of cattle, but to the saving an infinite consumption of hay, which by this husbandry may, at least, be pastured in summer.

The experiments on the turnips prove, first, that it is more profitable to raise them in drills, than in broast-cast: secondly, that the culture is a great deal cheaper: thirdly, that less manure will produce a larger crop, than in broad-cast, provided it be disposed in the same way as mine was: fourthly, practice shews the expence of drawing the drilled turnips for sheep or black cattle, to be at least two-thirds less, than drawing the broad-cast: fifthly, in the drill way not a turnip need be left upon the ground; whereas, in the broad-cast way, the leaving many is unavoidable, to the great annoyance of the succeeding crop, particularly if that shall be barley: and sixthly, that the land is left, after drilled turnips, in a much higher state of preparation for a succeeding crop, than it can possibly be in the broad-cast way. To these advantages another may be added, which I find very material, viz. that of slicing them for black cattle, which is highly neceſſary, even when they are ſmall, nay more ſo, for cattle are ſometimes choaked with a ſmall turnip. A man will be near as long ſlicing a ſmall turnip as a large one, and will make no diſpatch; whereas, my men and boys now ſlice for me every evening about nine hundred weight in an hour; which is a taſk upon them after night-fall, except on Saturday nights; then they ſlice double the quantity.

As it ſeems to be a paradox to ſay a man will ſlice a large turnip as ſoon as a ſmall one, it may be proper to explain it to the reader. The man is in danger of cutting his hands when he is ſlicing a ſmall turnip; but in no ſuch danger with a large one: and, beſides that, one ſlice of a large one contains more food, than two or three whole ſmall ones.

Theſe experiments prove, that the potatoe tillage, in the manner it is now generally practiſed, is not ſo beneficial an improvement of land, at leaſt not of ſtrong ground, as is generally imagined; although there is a greater conſumption of dung than in any other huſbandry.

The experiment with the lime, upon the fallow ground, proves lime to be an inſufficient manure, for the high improvement of lime-ſtone ground. There are ſo many advocates for lime as a manure, that it is adventurous to ſay any thing againſt it; but, I hope, the reader will obſerve, that I pronounce upon it, as being inſufficient, "for the high improvement of lime-ſtone ground." I have tried lime in another field of my farm, in which I ſowed wheat, and my ſucceſs was no better in that than in my turnips: and I earneſtly recommend it to every improver, who may have favourable opportunities of getting lime, that he try it upon a ſmall patch, before he launches into a large expence for it; ſuch caution may perhaps ſave him money. This advice ariſes from practice; for, I imprudently burnt a large quantity of lime, at an expence of near an hundred pounds, and, I can truly ſay, I have not received in benefit as many ſhillings.

The experiment with the ſhell marle, proves that to be a very high and excellent manure; for, as it will produce turnips upon poor ground, it may be ſafely relied upon for any other crop.

The native earth proves to be perfectly inſufficient for turnips; though it certainly mends the ground a little, beſides that it adds to a ſhallow ſoil.

Accidents and diſtempers.

Turnips are ſubject to be deſtroyed by the fly. In an orchard I ſowed two acres with turnip ſeed in drills in July laſt. They were invaded by the fly; I had a conteſt with them for a fortnight, and at laſt conquered them, with a loſs of only four or five perches of my turnips, which happened where there were moſt trees. Every morning before the dew was off, I had the rows daſhed with lime, which was ſlacked every day on purpoſe. This lime adhered ſo cloſely to the leaves, when they were wet with the dew, that it defended the upper ſides from injury: then I found the flies began upon the under ſide of the leaves, which I had never ſeen them do before; however, upon this, I was obliged to have the duſt thrown very low; and, whilſt the plants were wet, a great deal adhered to them, even on the under ſides:—thus I ſaved my turnips, which were as fine a crop as any I had, ſave the four or five perches before-mentioned.

The upper ſide of the turnip leaf, in its infant ſtate, is very ſmooth, and on that part the flies always lodge, unleſs they are interrupted; in that caſe they will deſtroy the plants by wounding the under ſide, which is not ſo inviting to the inſect as the upper, it being a little rough, though not enough to protect it from them.

The greateſt inconvenience I found in this work was, that every little ſhower of rain waſhed off all the lime, and then the work was to begin again; ſometimes I repeated it three times a day: however, it will be found to anſwer well, but it requires to be done with care.

I have, by the ſame method, ſaved lucerne, which is alſo ſubject to be deſtroyed by the fly, upon its firſt coming up.

I diſcovered laſt ſeaſon three diſtinct ſpecies of the turnip fly (if I may ſo call it) one of them is black; it ſeems to hop like a flea, and reſembles it exactly. The ſecond is a ſmall degree larger, and very diſtinguiſhably has wings, upon which are two ſmall white ſpecks; and the inſect is of an oval form. The third is like a domeſtic fly, but not by a fourth part ſo large.

The turnip-cabbage is ſubject to the ruſt, or mildew. In my orchard I had ſome plants put out, at different diſtances, for experiments; they grew very well for a time, but they were all infected with the ruſt, and thoſe neareſt the trees ſuffered moſt. In my field I could find but three, which were injured by this diſtemper. This ſeems to prove, that they require an open expoſure; and therefore they better ſuit the purpoſe, for which I have recommended them.

Turnips, cabbages, turnip-cabbages, and boorcole, are food for black cattle and ſheep.

A ſheep, I find, will conſume about twenty pounds of turnips in twenty-four hours, provided they are allowed as many as they can eat, which ſhould always be allowed to fat ſheep: but as ſheep vary in ſize, ſo I preſume will they conſume more or leſs food.

An acre of turnips, of forty-ſeven tons to an acre, will maintain one hundred ſheep fifty-two days, allowing each ſheep twenty pounds a day. My ſheep weigh about twenty pounds a quarter.

In the month of November laſt, I gave my ſheep acceſs to ſome pea-ricks, which I had erected on purpoſe for them, of which they eat with great eagerneſs; but I find they affect them in the ſame manner as they do horſes, when given to them new; for the ſheep, I apprehend, from violent cholicks, which, I conceive, the peas gave them, were ſeized with ſtrong convulſions; and in this way I loſt ſix of them, in a few days, before I conſidered what could be the cauſe: but having examined the inteſtines of every one of them, and finding no ſymptoms of any other diſeaſe, I was led to draw the above concluſion; and what ſeems to confirm my opinion is, that I have not loſt one ſince I took them from the peas. If other perſons have not met with the like accident, who have fed their ſheep with new peas, it ſhould ſeem that turnips and peas together do not agree with ſheep. However, that is a fact which I ſhall ſoon be able to determine, for I ſhall admit the ſheep to the peas again to-morrow, which will be the twentieth of February; a ſeaſon in which it is imagined we may ſafely give peas of the preceding year to horſes, and therefore, I conceive, there can be no danger in giving them to the ſheep: but, if they ſhould be affected as they were before, I think there cannot remain a doubt, that the peas and turnips diſagree in their ſtomachs. And here I ſhall leave a ſpace to add to my report hereafter.

Now, the fifteenth of March, the ſheep have been ever ſince at the peas, and I have not loſt one.

Of cabbage, and turnip-cabbage, a ſheep, of about twenty pounds a quarter, will conſume about fifteen pounds a day. An acre, at that rate, will maintain one hundred ſheep about thirty-four days. The cabbage, and turnip-cabbage, are a firmer and more ſubſtantial food than turnips.

I have fed a cow this winter upon turnips, and I have now two bullocks which are ſtall-feeding upon turnips alſo. It is computed that they weigh between four and five hundred weight each; and I find by experiment, that they each of them eat about two hundred and ſixteen pounds in twenty-four hours; which is, therefore, about half their own beef-weight; from hence we may, with reaſon, imagine a beaſt will eat every day of turnips, at ſtall-feeding, about fifty-ſix pounds for every hundred weight of beef he may contain.

One of the bullocks was put up miſerably poor from the plough, for an experiment, on the fourteenth of December: he took kindly to the turnips; and on the ſixteenth I began to give him, with his turnips, pea-flower, to the amount of eight pounds every day; and I find he is greatly improved, but he will not be beef; though I am very inclinable to think, that if he had been put up ſix weeks ſooner, in April, he would have been good beef. This experiment I ſhall repeat next year. What induced me to mention it here is, that ſome other perſons may perhaps try it next winter, and, if they ſhould, I ſhall be much obliged by their report of the effect. I am led to believe, that bullocks may be profitably fed with peas, becauſe horſes, and pigs, thrive very faſt upon them.

When

When the cattle are firſt put to turnips they dung but little, the turnips going off chiefly by urine, the quantity of which is really incredible; but, after ſome time, they dung more; and, from a whitiſh colour, the dung reſumes the natural colour, and is of the common firmneſs. I allow each of the cattle ſeven pounds of hay every day, and I do not find that they eat fewer turnips on that account; the reaſon, I believe, is, that the hay makes them more eager for the turnips. They refuſe water.

To each of my cows, and ſtore-cattle, I allow ſeventy-two pounds of turnips a day, and a little ſtraw, thirty-ſix pounds being what I find a moderate-ſized beaſt will eat at a meal. To my plough bullocks I allow the ſame quantity of turnips, with as much ſtraw as they can eat; but I forbid their having the turnips till they have been unyoked about an hour, and after they have eat ſome ſtraw; as I conceive the turnips are too cold for them immediately after their labour.

I have lately confined a milch cow four days, and fed her with turnips, and I could find no diſagreeable flavour in her milk from that food, though I have often heard turnips complained of as giving a bad taſte to the milk, when cows are fed with them. Query, whether it might not ariſe from the leaves of trees falling upon the turnips? Leaves of trees always ſpoil the milk when cows eat them.—Here follow,

Calculations upon the feeding black cattle with turnips and cabbages.

Suppoſe four cows or bullocks, of four hundred weight each to be ſtall-fed upon turnips, allowing each beaſt two hundred and ſixteen pounds a day, an acre of forty-ſeven tons would maintain them one hundred and twenty-one days. Indeed a larger ſtock ſhould be put up, or heavier cattle, as the turnips will not keep ſo long.

Suppoſe ten dairy cows to be maintained upon turnips, allowing each cow ſeventy-two pounds of turnips a day; at this rate, an acre of forty-ſeven tons will keep them one hundred and forty-ſeven days. All cattle, fed in this manner, ſhould have about ſeven pounds of hay a day allowed to each.

The fat cattle eat about one hundred and a half of cabbages a day; therefore an acre of twenty three tons will, at that rate, maintain four bullocks, of four hundred weight each, ſeventy-ſix days.

When fed with cabbages, they dung more, and make leſs urine, than when they are fed with turnips, and will drink a little water.

Hence I am induced to believe, that cabbages are a better food for cattle than turnips. I am fully perſuaded near as many tons may be raiſed upon an acre, with proper ſeed and good management; but they will coſt five or ſix ſhillings an acre more.

There remains one general obſervation to be made, and which I imagine contributed greatly to the ſucceſs of the abovementioned crops, viz. that we had for theſe ſpecies of crops, very ſeaſonable and fine rains. From the ſixth of July, on which day I began to put down my cabbage-plants, to the firſt of December, both incluſive, we had ſeventy days, in which there was, more or leſs, rain; and the latter end of Auguſt, and beginning of September, the heavieſt dews that I have ſeen. From the ſixth of July to December the firſt, both incluſive, were one hundred and ſeventy-ſeven days; ſo that we had but one hundred and ſeven dry days, many of which, I ſee by my kalendar, were cloudy and inclinable to rain.

" Land, ſays an Eſſex farmer, cannot be brought into too good tilth for ſowing turnips: they require a deep, looſe, well-wrought mould; and to effect this, diſcreet plowing and harrowing is the beſt way. I ſay diſcreet, becauſe one plowing, properly timed, is worth three that are out of time. It is a maxim in huſbandry, that ſome land cannot be plowed too much; but we ſhould add, at proper ſeaſons and intervals, or an ignorant farmer might ruin himſelf, and yet think he had followed the directions that were given him.

" A light land requires leſs plowing, as well as leſs nicety in the times of plowing, than a ſtiff heavy ſoil; and it is alſo ſooner brought into good tilth: two well-timed plowings will often do it; whereas a clayey ſoil will require three or four, before it is brought into order.

" An early plowing will greatly forward the getting a ſtiff ſoil into order: the month of April ſhould be the lateſt that ſuch, when intended for turnips, ſhould be turned up. It may then lie till the beginning of June, when it ſhould be harrowed down with loaded harrows to break the clods, and immediately croſs-plowed: about a fortnight after this it ſhould be plowed for the laſt time, and immediately croſs-harrowed and ſowed out of hand with the turnip-ſeed pretty thick, and ſcratched with a light harrow to cover the ſeed.

" Light lands, as I ſaid before, may do very well with two plowings, one in the ſpring, and the other juſt before ſowing at Midſummer.

" I look upon it that turnip-ſeed cannot well be ſown too thick, for it ſeldom all comes up, and of what does get above ground, much is often deſtroyed by the fly, and ſlug; ſo that the plants ſometimes, though the ſeed was ſowed thick, require but little thinning by the hoe. In fact, I think it better at firſt to beſtow an additional quantity of ſeed, than to have to ſow three or four times over, as I have been often obliged to do, till I practiſed this method of ſowing thick, which generally ſucceeds very well with me.

" The beginning of July is the time in which I, for the moſt part, ſow my turnip-ſeed: in this matter the grand affair is to hit it off, ſo that the turnips do not grow ſticky or ſpongy before the winter, and yet are forward enough in their growth to reſiſt the froſts, &c. and be fit food for the cattle in the winter, or in the ſpring.

" To have a good and profitable crop of turnips, it is abſolutely neceſſary they ſhould, at proper times, be hoed, not only to kill the weeds, but alſo to thin the plants, and ſet them out at a proper diſtance.

" The proper time for the firſt hoeing, is when they have put forth their fourth leaf, and the ſecond hoeing ſhould be in about three weeks afterwards: twice is, in general, enough, unleſs a very following rainy ſeaſon ſhould come on, when it will be proper to take the advantage of the firſt ſun-ſhine weather, to give them a third hoeing: this, indeed, is often neglected, but I always found it pay well, by the thriving condition it put my crop in.

" As to the diſtance at which the plants ſhould ſtand one from the other, that muſt be regulated by the ſize of the turnip; but it ſhould be never leſs than one foot, nor is there occaſion for its being more than two: about ſixteen or eighteen inches is a proper diſtance for the common turnip we generally ſow about me.

" If the ſoil, on which the turnips grow, is light and dry, the moſt profitable way is to feed your ſheep on them in the ſpot where they grew; but if the ſoil is heavy and ſtiff, it is beſt to have them pulled, and carried in tumbrils on to ſome dry paſture, or on any dry field you want to mend; for was you to feed them on the land, one half of them, at leaſt, would be rolled in the dirt, trodden under foot, and ſpoiled.

" Land cannot be too rich, or too well dunged, for bearing turnips; and this will bring them forward, and make them eſcape the fly better; for when once the leaves become rough, the fly does not chuſe to touch them: it is therefore certainly beſt to encourage them in their growth, and bring them as ſoon as poſſible out of danger.

" When my young crop of turnips have come up, and I have been fearful of the fly, I have frequently ſown over them wood aſhes, and ſometimes ſoot: theſe have been of great ſervice, eſpecially if gentle rains followed, as neither the flies nor ſlugs choſe afterwards to touch them. But I muſt obſerve, that this is no ſafe remedy, if the weather is dry and hot, for aſhes being of a hot nature, will then be apt to burn up the crop.

" As to the ſlugs, the beſt way of deſtroying them in dry weather is with a light roller: this cruſhes and kills them, and does the crop ſervice, eſpecially if it is light land; for it preſſes the particles cloſer, ſo that the moiſture in the earth is not ſo ſoon exhaled by the heat of the ſun; conſequently, the young turnips do not ſo ſoon ſuffer by a continued drought.

" It is ſcarcely neceſſary to obſerve, that dry weather is beſt for hoeing turnips in, as then neither the weeds nor the turnips that are cut up are apt to grow again.

" In

"In light gravelly or sandy soils, the seed of turnips may be deeper covered than in stiff clayey land: in the first it may be pretty well harrowed in; in the latter, it should only be slightly scratched with a very light short-tined harrow, or even only bush-harrowed; as by that means they will sooner appear above ground, be sooner out of danger, and thrive better afterwards, the apple of the root growing almost entirely out of the ground, the whole nourishment being collected by the tap-root, and by the horizontal roots, which issue from it on all sides.

"The quantity of seed to be sown on an acre, should be from two to three pounds, according to its goodness; and many use equal qnantities of old and new seed, thinking this method best; for the new seed comes up first, and if the fly takes it, the old seed in a day or two succeeds, and generally fares better.

"If a crop of turnips fails, either through any defect in the seed, or by the ravages of the fly or slug, it is usual for the farmer to sow the same land again; and this, if there is occasion, he repeats two or three times, till at last he secures himself a crop. For the reason above-mentioned, it is esteemed best to sow early, as by that means there will be time, if the first crop fails, to sow another.

"Turnip-seed is very apt to take damage from wet, if it is not covered as soon as sown: without this precaution it will sprout prematurely, malt, or mould: by too early a germination the seed is apt to burst.

"When peas are sown on a rich mellow earth, they are apt to grow rank: in this manner they cover the ground, keep the moisture in it, raise a kind of fermentation in the soil, and make it hollow and porous; insomuch that when the crop has been off, turnips have been harrowed in without plowing, and have thriven amain: but there is danger in pursuing this practice without great caution." *Museum Rusticum, vol.* I. *pag.* 205.

"I have, in my time, says a Norfolk farmer, sown a great deal of land in turnips, and have applied them with great advantage to various uses; but our chief reason for cultivating them in this county is for feeding and fattening sheep.

"It is almost needless to say, that they answer this purpose extremely well: their use is too well known to all the eastern farmers, to be in these days controverted.

"We have various methods of spending them: some fold their sheep on the land where the turnips grew; I have done this, but it is not a method I approve of: however, for the benefit of such farmers as chuse to practise it, I shall give one caution; which is, that they use wicker hurdles for folding their sheep, which will otherwise be apt to thrust their heads through the bars, and, tangling themselves, are by that means often killed in the night, to the great loss of the owner.

"If, however, it should not be convenient to the farmer to get these wicker hurdles, but he should be obliged to take up with those made of rest stuff in form of a gate, let him then be careful, when he has set his hurdles, and staked and bound them tight, to pull up all the turnips that grow within two or three feet of the outside of the fold, and throw them over the hurdles for the sheep to eat within-side.

"This will take away any temptation the sheep may have to put their heads through the bars, and they will, by that means, escape the danger of being strangled.

"Every animal is fond of liberty; and though the sheep will bear confinement, perhaps, better than any other creature, yet whoever has seen them when first driven into the fold, must have observed that they naturally go round the hurdles to try to find an opening to get out at: by this means the turnips which grow near the hurdles are trampled on, dirtied, and spoiled. For this there is a very easy remedy; let the shepherd only pull up all the turnips that grow near the inside of the hurdles, and all will be well.

"I observed before, that I am not fond of giving my sheep turnips as they grow: I think it much the better way to have them pulled; by this means they have an opportunity of eating the whole root, and my stock of winter-fodder goes much farther; whereas, when they feed on the turnips as they grow, they generally scoop them out, and leave a hollow shell in the ground, which, though it may afterwards be forked up, the sheep will scarcely even by hunger be induced to touch, as it cannot but be soked by the dung, urine, and dirt, from the feet of the sheep.

"*I find it then the best way, to have my turnips pulled before they are given to my sheep; they go much farther, and do them more good.*

"But in this method there is one seeming inconvenience, which is, that in frosty weather, when the ground is hard, I cannot have them pulled; yet this difficulty is very easily removed, by laying up, at the beginning of the winter, a sufficient store of turnips, secured from wet, and not much exposed to frost.

"I think it worth while to have a building particularly dedicated to this use, and find it answer well: it is built in form of a small barn, and boarded round.

"In the beginning of the winter, before the frost sets in, I have a large quantity of turnips pulled, and the dirt is carefully scraped off them; and, after cutting off the heads and tap-roots, I cause them to be regularly laid in my store, with this caution, however, that all round the sides next the boarding, my men lay straw, to keep out the frost. The heads, or tops, I give to all my cattle in general, as they are cut off; by which means I, in fact, suffer no loss.

"I find these stored turnips a happy resource when hard weather comes on; then I open my repository, and deal them out to my sheep in such a manner that there may be no waste; and as soon as the weather breaks, and the earth becomes less hard, I resort again to the fields, and have them pulled as usual.

"For some years I had another manner of storing my turnips, which was by digging a deep pit in a sandy, dry field, which being filled with turnips, they kept there very well; yet, as this method was subject to many inconveniencies, I left it off.

"I have discovered another use for the turnip, besides feeding my sheep, oxen, and cows with it, which I must mention before I conclude this letter. I find it agrees remarkably well with hogs, which will eat of it greedily, and thrive on it apace.

"I have several times tried this, and have often killed fine young porkers that had for many weeks eat nothing but turnips boiled in swill, or wash, till they were tender.

"I have at other times given turnips to large hogs, that have been put up to fatten, in order to their being killed and salted for family use; and here I was not disappointed in my hopes; they always came on well: but I made it a custom to give them, for a week or two before they were killed, a few bushels of boiled peas, in order to harden their fat, that it might not boil away in the pot.

"I gave them boiled peas rather than raw, because, having been long used to eating the soft turnip, I found they did not afterwards take kindly to the hard, raw pea.

"Hogs may easily be brought to eat raw, unboiled turnips; but it is much better to boil them when the hogs are to be fattened; for, though they will eat enough of them raw to keep them in tolerable good plight, yet they will not eat enough to fatten them apace." *Museum Rusticum, vol.* I. *pag.* 335.

"I had last winter, says an ingenious clergyman of Northampton, a piece of turnips intended for feeding sheep; but my method of consuming them at first astonished my neighbours.

"I fed them off by the fold; but I first turned in some ewes, which greedily devoured all the tops and leaves: when they had finished them, I immediately folded my ewes on a fresh spot.

"After the leaves were eat off the first spot enclosed by the hurdles, by the ewes, I turned in some wethers, which eat with a very good appetite the apples of the roots, leaving, however, the lower part scooped out in the ground: these I had forked up, and they were eat by my store-sheep.

"My neighbours were convinced my method was right, because I evidently kept and fattened more sheep on the same quantity of land, than they did; yet they begged I would give them my reasons for this my practice.

"I told them I would readily comply with their request, and the more so as it might be a means of tempting them to imitate what they saw practised with success.

"Continuing my discourse, I informed them that many years experience, and constant observation, had convinced me, that if you turn a parcel of sheep promiscuously into a field of turnips, the ewes and lambs would immediately attack

attack the leaves; the fattening wethers would, for the most part, prefer the apple of the root; and the store-sheep, not being nice, would indiscriminately devour both leaf and apple, and even eat the leavings of either of the others.

"I farther informed them, that I had frequently observed, that when a parcel of wethers have been turned into a piece of turnips, the farmer, thinking to have no waste, generally kept them in till they have eat the roots clean up. But this is very bad husbandry; for after the wethers have eat the most delicious and sweet part of the root, they loathe the rest, which is generally gritty, dirty, and sodden, insomuch that nothing, but absolute hunger, will tempt them to taste it. In this period they pine, and lose flesh; and by the time they are turned into a fresh bite of turnips, they are but little better than they were at first.

"The appetite of a beast that is fattening should be tempted, not palled; and undoubtedly, such of the sheep as are most forward will be most delicate; and this delicacy, if the farmer is wise, he will indulge, as it will eventually turn out to his advantage.

"Thus, in my manner of feeding turnips, the ewes come first, because they prefer the leaves; the wethers that are to be fattened follow, and make the most pure and sweet repast; and the store-sheep, which are the least nice of any, come last, and clear off the remains; at least, as much of them as they ought to be permitted to eat; for I do not hold it good to oblige them to eat what are in a half putrefied condition, and sodden with dung and stale.

"My neighbours were so well pleased with my reasons, and so well convinced by what they saw, that they are determined to adopt my practice; and if any of your readers should be of the same mind, it would give me great pleasure, as I cannot feel a truer joy than what results from my endeavours to be of service to my fellow creatures." *Museum Rusticum, vol.* II. *pag.* 231.

"I last year sowed some turnips, says a farmer near Chelmsford, on near ten acres of good light land. Some other business interfering, prevented my getting them hoed in due time, insomuch that, by the latter end of August, they seemed to be almost covered with weeds.

"Being willing to endeavour at recovering my crop, I caused the field to be harrowed and cross-harrowed, which set them out pretty well, and cleared away a great number of the weeds, insomuch that the turnips got ahead, and grew to be a tolerable crop.

"I send you this for the information of some farmers, who, when they have delayed hoeing their turnips for a few weeks, if the weeds get forward, think they have lost their crop; whereas, would they adopt this method, which has been more than once recommended, they would find it answer any reasonable expectation they could form. I have several times tried it, and it always succeeded with me more or less. The work costs but little, and the benefit resulting from it is considerable. I have known farmers plough up a crop of turnips which, by harrowing, would have yielded them a good return." *Museum Rusticum, vol.* V. *pag.* 239.

"I have known many, says farmer White of Suffolk, who intend feeding off their turnips with sheep, keep the turnips till they are too old to be applied with advantage to that use. Your readers may give me credit, for I speak from experience; and I can assure them, that one acre of young turnips is of more value for fattening sheep than two acres of old ones, as the wethers you turn in will get flesh and fat at least as fast again on the first as the last.

"Let this maxim be treasured up in the farmer's memory; and let him not at any rate be tempted, for the sake of spending a few weeds and grass on his fallows, to keep his turnips till they are of little worth.

"If any of your readers should be incredulous, let them try the experiment; it will be but little expence, and still less trouble. I did so myself before I adopted the practice, and was in a very short time convinced: this happened some years ago, and I have continued this method ever since." *Museum Rusticum, vol.* II. *page* 279.

We shall conclude this article with the following letter we were favoured with from Mr. Matthew Cox, of Wallhampton, near Limington, in Hampshire.

"I have, says he, inclosed you a draught of a hoe-plough, which I have found to answer very well for hoeing carrots and turnips, which may probably be improved by some of your society: the following is the particulars of its success this year, 1766. I took possession of the farm I live on in April, and going soon after to London, ordered my servant to sow two acres of carrots with four pounds of seed; on my return, I found he had sown all the seed I had left him, being twenty-eight pounds. In May the carrots came up as thick as sand on the shore. The people here being intirely unacquainted with the method of hoeing, made my work very tedious, as I was obliged constantly to attend them, it cost me sixteen and six-pence *per* acre, and the work not half done; I then harrowed them, &c. according to Mr. Billing's directions, and in June found ten times too many to come to any size; but could not get the second hoeing performed under one guinea *per* acre: I then gave directions for this hoe, which I fixed to the common horse-hoe plough, and hoed my two acres in five hours with ease; next day I harrowed them with common harrows. About ten days after I harrowed them again, and have kept nine horses on them ever since August, except a quarter of oats in feed time.

Whoever uses this plough will find it answer the first hoeing extremely well, as it will leave whatever it hoes in two inches and a half distant; consequently the second hoeing, which must be by hand, will be very trifling; and often there will be no occasion for it. I first hoe the long way of the land, and then cross it. The hoe I have is bare two inches; but I find it is too narrow.

a a, Plate XXVI. Fig. 5. are the two out-sides of the hoe, which are flat, and so go on the out-side of the block on the common horse-hoe at A A, Fig. 4.

b, Goes on a mortice at the bottom of the block, at *b*.

c, The pin goes through the holes on the flat sides of the hoe at *a a* and the block A A.

d, *d*, *d*, The cutting parts two inches and a half wide; and leaves a space of two inches and a half.

E, A chain that hooks to a staple on the beam, and keeps all steady. I have ploughed ten inches deep with this hoe.

F, F, Two bars of iron worked in to the three uprights.

I always use the harrow belonging to the common horse-hoe with the above. I sometimes fix M. De Villier's cultivator to the above carriage. I have a field of twenty-two acres of wheat, in which is sixteen different ways of sowing, preparing the seed, and manuring the land.

TURNIP-CABBAGE, the name of a species of cabbage, so called because the stalk, at some distance from the ground, after rising of the usual thickness, and in the manner of those of other cabbages, enlarges suddenly to such a degree, that it forms a knob of a very large turnip; of which likewise it has sometimes the figure, though it is, in general, more oblong.

By this peculiar formation of the stalk, or production of the turnip-like knob, together with its being perennial, this species of cabbage is distinguished from all others. From the top of this turnip rise a number of leaves, of a greenish-red, or sometimes greenish-purple colour; which answer to the radical leaves in other plants. They do not, though this plant is truly of the cabbage kind, ever close together, and form a compact globular or oblong mass, as in the common species; but keep their erect growth, or turn outwards.

From among these leaves spring a number of other stalks, of which, those that are nearer the extremity, branch, and send out flower stalks, spreading horizontally; and those that are more in the center, grow erect, and without branches. On these stalks are leaves, springing out alternately, and of the same colour with the others. The flowers are small and yellow, and succeeded by long cods, full of seed, of the size of that of mustard, and a light-brown colour. We have given a figure of this plant on Plate XXVI. Fig. 6.

It may be justly doubted, whether or no this plant be originally a native of our country; though it is at present found growing wild in some places near Dover. But, from its general character, which does not agree with the indigenous

genous plants of the same kind; from its being unknown to the earlier botanic writers, or, at most, known only in the view of an exotic; and from its being now to be met with wild, only in the one place mentioned, it is most probable, that what is there found was the produce of seed conveyed originally thither by some accident; and which has since propagated itself, and spread spontaneously, as it easily might, from its perennial nature and extreme hardiness. It is frequently cultivated in gardens, where there are collections of vegetables: but, for the most part, rather as a curious than an esculent plant. Though certainly, the turnip, or knob, is at least as wholesome as either any turnip or cabbage, and is much liked by some; and the leaves are also thought good by others; but, in general, both are said to be strong, and seldom admitted to the table with us. This plant, however, affords sprouts, which, after they have undergone the action of a strong frost, are exceeding good; and may consequently be had at the time when all others fail. The lying in very small room, proportionably to the quantity of solid substance, and the keeping good much longer than any other sort of vegetable of a similar nature, are qualities, moreover, which fit this plant in a most peculiar manner for the use of seamen, as is ingeniously remarked by Mr. Baker, in his report to the Dublin society. *See the article* TURNIP.

It appears from Gerard, that there were, in his time, two kinds of this plant; one of which he calls *caulorapum rotundum*, or round rape-cole; and the other, *caulorapum longum*, or long rape-cole. The difference of these two kinds consisted only in the form of the knob or turnip, as is expressed by the names themselves; and in the long kind's shooting forth smooth indented leaves from the turnip part, which leaves the round kind wanted. I have here sent you a sketch of these two kinds, according to the prints Gerard has exhibited of them; and they may serve also to give some idea of the general figure of the plant, to those who have never met with it.

I have not however seen in any garden, nor find any traces in the late writers, of more than one kind of this plant; so that if the round and long kinds, mentioned in this manner by Gerard, were really different species, the long is now lost. But it seems more probable, that this was only a degeneracy of the plant, by means of the farina of the common kinds of cabbage; as the deviation from the round knob towards the plain stalk, and the breaking out of the leaves from it seem to indicate.

If there really were two original kinds, or this difference arose from a permanent seminal variation, it would merit attention under the present circumstances to recover them; since it frequently happens in correspondent cases, that where there are two allied species, the one has qualities which fits it to a particular purpose in a very superior degree to the other. This plant was rare in Gerard's time in our country; as he mentions his having the seed from Spain: and indeed it was so little known, that he says it is to be sown and set as cucumbers and melons; and that it was then accounted a dainty meat. It did not however make its way to the table in common, or even as a curiosity in gardens, much more at that time than since. For Parkinson, who wrote after Gerard, and enumerates many more species of cabbage than his predecessor, does not take the least notice of it. Tournefort, and most of the later writers, mention this plant under various names; but they do little more with regard to it, than give the name and description. Miller, in his Gardener's Dictionary, says, this kind of cabbage "never varies, for I have cultivated it many years, and have not found it to alter. It grows naturally on the sea-side, near Dover. It hath a perennial branching stalk, in which it differs from all other species. I have cultivated it these three or four years, and have eaten the young shoots, after they have been much frozen, when they were very sweet and good; but at other times they are very strong and stringy. In very severe winters, where the other sorts are destroyed, this is a very necessary plant, for the most severe frosts do not injure it."

Till lately we see, therefore, this plant was only considered, either as a kind of curiosity in botanic, or other gardens, where there were collections of different kinds of plants, or as an esculent herb: but, in this latter view, it seems not to have acquired any great reputation, as it is so seldom, even notwithstanding Miller's recommendation, met with on the table here; though I am well informed, that in some of the factories in the East-Indies, it has been cultivated from European seed, and is much liked.

The first public notice I find taken of this plant, in the present view of cultivating it for feeding cattle, is in a pamphlet published by the late Mr. North, gardener, near Lambeth, who speaks of it, under the article of cabbage; of which he says, "There are four species that may be cultivated to great advantage for cattle; to wit, the white cabbage, the hardy curled Savoy cabbage, the turnip-cabbage, and the green curled cabbage." When he comes to treat particularly of the turnip-cabbage, he thus expresses himself: "The turnip-cabbage is one of the hardiest roots that grow; and I dare affirm, might be propagated to great advantage for feeding sheep, &c. For in the most severe winter that I can remember, when cabbages, savoys, turnips, &c. have all been demolished by the extremity of the weather, the turnip-cabbages have not been hurt. The turnip part grows all above ground, which is crowned with many large smooth leaves, like those of the red cabbage, but which grow open like the tops of turnips. They are a very solid juicy root, and do not grow spongy when they are old, as turnips do. The tops may be cut off, and given to sheep, &c. in the spring, and the roots laid by in an out-house to feed them in April and May, when no other roots can be had. Sheep are so fond of these roots, that they will leave the best turnips for them. When they are given to sheep, they should be cut to pieces; but they will eat them fast enough, tops and bottoms, as they are growing in the fields. After Michaelmas, when turnip-cabbages have their full growth, they will weigh from four to eight pounds a root."

It may be proper here to caution against a misconception, from the inaccuracy of an expression of Mr. North's, in calling the turnip-like part of this plant, a root: for it is no more than an enlargement of the stalk in that part; being, when the plants are large, several inches above the ground. It is proper to observe likewise, that Mr. North has under-rated the weight of these plants; it appearing, by Mr. Baker's account, that some weigh fourteen or fifteen pounds. This is the first notice I find in any published work, of this plant's being considered as proper for feeding cattle: but it appears in the minutes of the society's books, that some little time before the publication of this pamphlet, on the enquiry set on foot by the late Mr. Wych, concerning a proper food for cattle in hard winters, this plant, together with the Chinese or white vetch, and the Syberian medicago, were proposed to the Committee of Agriculture for their consideration, by a gentleman well known to that society; and this plant was particularly recommended for its hardiness in the ground, its quality of not rotting, though long kept, its nutritive property, and the fondness which cattle shew for it, when offered to them as food.

Mr. Baker, nevertheless, whose report on this subject to the Dublin society, the reader will find under the article TURNIP, must have the honour of being the first who really introduced this plant into use, as an article of husbandry. For it was on the authority of his judicious experiments, related in that report, the same gentleman, who formerly recommended the turnip-cabbage, as above-mentioned, to the London Society, induced them last year to offer a premium for its culture: and there is no one object of a similar nature, hitherto taken into consideration, either by this society, or that of Dublin, which bids fairer for being of great public utility: as this plant seems to answer all the ends of what was sought for, with so much pains and attention, in the research set on foot by Mr. Wych, after a proper winter pabulum (as it was called by him) for cattle in scarce winters.

The turnip-cabbage may be cultivated in the manner of other cabbages; of which the particulars may be seen under the article CABBAGE. But the success Mr. Baker had with his method, particularly in relation to the magnitude of the turnip, which seems to go far beyond Mr. North's notion, recommends strongly the trial of that manner; except that, as he properly remarks, where the plants are raised in the spring, the seed should be sown in the very beginning of March; the plantlings, transplanted to a proper close bed, as soon as they are sufficiently strong to bear it; and the final transplantation of them out into the field at the distances in which they are to grow, should not be deferred later than the beginning of June. This would both give more time for the plants to become large before winter, and a better chance to avoid a total want of rain, after transplanting; the only accident, except the destruction by caterpillars, or other insects, to which this kind of crop is subject; as the plants bid defiance, after they have firmly taken root, to all inclemencies of weather, either with respect to cold, wet, or drought.

It may be inferred from the above particulars, which, as we see, stand on unquestionable authority, that, considered as an article of husbandry, this plant must be a very valuable acquisition; as it is of easy culture, and as little subject to fail by accidents, as any crop whatever: as the produce, with respect to quantity, is likely to prove, under favourable circumstances, thirty-five or thirty-six tons per acre, as appears from Mr. Baker's account: as its produce is greatly preferable either to turnips or other cabbages; being much more nutritious, and less watery and cold; a fault in the common turnips: as it may be depended on in the most rigorous and severe season, when every thing else but dry fodder fails, and may be taken from the place of growth, in case of exigence, whenever the ground is not covered with a very deep snow: and as it is much liked by neat cattle, sheep, deer, and hogs; agrees perfectly well with all of them; and fattens them in the most profitable manner. This is certainly very sufficient ground of recommendation, as an object of premium, to the London Society; and it is hoped, will be so, as a subject of experiment and trial to those gentlemen, or more liberal kind of farmers, who attempt improvements in husbandry.

I have thus endeavoured to give all the light I can into the nature of this plant, considered as an article of husbandry: but before I conclude, I must beg leave to subjoin a few words respecting it in another view, of such importance to a particular set of men, whose health and safety manifold reasons recommend to the care of the public, as makes it merit a very serious consideration. What I allude to is, the intimation given by Mr. Baker, of the probability that this plant might be rendered extremely serviceable to seamen in long voyages. As there can be no doubt of the just foundation of this opinion, it ought to be kept in sight as much as possible, till the matter be realized in practice. The putrid scurvy, arising from the eating salt provisions, is the great bane of a sea-faring life. The numbers disabled or carried off by it, particularly in time of war, are almost incredible; and, if we consider the public value of lives so lost, both with respect to the national power and expence, policy, as well as humanity, bids us listen to every feasible proposal for mitigating this evil. The use of vegetables in the diet along with the salt-beef or pork, is well known to be one of the most effectual means of prevention of this disease: and indeed, it has been so well understood, that great quantities of cabbages, &c. have been sent off to the fleets cruising in the bay, or elsewhere within reach, to the great relief and refreshment of the men. But this species of cabbage, abounding more in the saccharine juice than the other kinds, would be a more efficacious preventative or palliative of the scurvy; and the solid compact texture of these turnips, which makes a considerable weight, lye in a small compass, together with their repugnance to that putrefaction, to which other turnips, cabbages, &c. are quickly disposed, renders it practicable to keep them on shipboard, in any climate, for many months; provided they be preserved from the access of any extraordinary degree of moisture.

If this plant should be, therefore, generally cultivated in the field-way, and consequently produced at a very cheap rate, as Mr. Baker has shewn, that betwixt thirty and forty tons may be obtained by an easy method of culture, in one year, from one acre of ground, they might be purchased at a much cheaper rate than any other article of provision at present in use for the victualling ships.

This seems to be an object very well worth the consideration of the India company; as it might be a means of preventing that delay and ill success of some voyages, which arise from the sickness of the men; and it is attended with no difficulty, but what regards the stowage. For the plant being already cultivated in some of the factories in the East-Indies, where it succeeds as well as here, and consequently might in all the others, as no climate or season appears injurious to its growth, it might be procured at a proportionably cheap rate, as well for the supply of the homeward as outward bound ships: and indeed, considering the nature and state of the provisions on board ships returning from India, it would undoubtedly be peculiarly beneficial in that case. *Museum Rusticum, vol.* VI. *pag.* 46.

TURPETH, a species of the convolvulus or bineweed. *See the article* BINEWEED.

TWIFALLOWING, or TWYFALLOWING, ploughing the ground a second time, which is generally done in June.

V.

VALE, low ground; a valley.

VAN, an instrument to winnow corn. *See the article* THRESHING.

VASCULIFEROUS PLANTS, fuch whofe feeds are contained in veffels divided into cells.

VAT, *or* FAT, a veffel for holding wine, ale, beer, cider, &c. in the time of their preparation.

UDDER, that part of a cow, mare, ewe, &c. where the milk is prepared, anfwering to the breafts in women.

VEGETABLE, a term applied to all plants, confidered as capable of growth, *i. e.* all natural bodies which have parts organically formed for generation and accretion, but not fenfation.

Vegetables, according to the analyfes made of them by chemiftry, are diftinguifhable into two grand tribes, the acid and the alkaline; the firft affording a volatile acid, and the fecond a volatile alkali, upon a dry diftillation: thus guaiacum, cedar, box, cinnamon, cloves, forrel, mint, balm, &c. afford an acid; but garlic, onions, horfe-radifh, fcurvy-grafs, muftard, &c. afford an alkali, which, rectified, is hardly diftinguifhable from that of animal fubftances, fo as nearly to refemble the fpirit and falt of hartfhorn.

VEGETATION, the act whereby plants receive their nourifhment and growths; of which, three principal functions are underftood, viz. nutrition, increafe, and generation.

From Scripture we learn, that the earth has been endued, from the beginning, with a certain feminal virtue to produce plants; which virtue, proceeding from God, was not confined to the firft production of things, but extends likewife to all future confequences of times; and this faculty which the earth has of producing plants, is from this commandment of the Almighty: "Let the earth bring forth grafs, the herb yielding feed, and the fruit-tree yielding fruit after his kind, whofe feed is in itfelf upon the earth; and it was fo." Gen. i. 11.

Philofophers afk, what can be that virtue the earth is faid to be endued with, if it be only an inherent quality whereby it produces, naturally, all forts of plants, without the concurrence of feed? or if a feminal virtue (or feed) muft be adminiftered to it? Some follow the firft opinion, for this reafon, that earth dug up from a great depth and put into pots, after a fet time or feafon, produces feveral forts of plants of itfelf without feed; but though this opinion be approved of by many, it has not, however, the leaft appearance of probability on its fide; for who (confidering with attention the progrefs of nature, fees the marvellous mechanifm of the organs of plants, the whole texture of their internal as well as external parts) could be perfuaded to attribute it to a heavy and indigefted mafs of clay or earth: therefore, it is more rational to fay, that plants have their origin from feeds, which being taken from the firft plants, have propagated their fpecies by the Creator's will, as far as our times, and will continue to do fo (particularly where they are natives) to the end of the world.

The fun, rain, the exhalations of the earth, and the reft of the exterior caufes, are capable to excite a certain motion or fermentation in the bofom of the earth; but unlefs there be a feed which contains already the conformation of the plant, whofe parts are unfolded by that fermentation, never fuch fermentation or motion can give origin to the plant; therefore, we have great reafon to think, that all plants have their origin from feeds, actually or potentially, fince the firft rudiments of a plant can be difcovered no where elfe, nor by the naked eye, nor even by the help of a microfcope; fo that the feed contains not only the coarfer matter of the plant, with its organical parts, which have the ratio of a body, but likewife a certain fpirit, that is, an active and vegetative fubftance, which may be called the foul of the plant. Although, in fome manner, it may be faid to fleep in the grain or feed, yet when excited to motion by the heat of the fun, the warmth of the earth, and with rain impregnated with particles of volatile falts, it then unfolds its parts and pufhes the embryo plant forward.

A fprig or cutting muft contain in it this feminal property, for being fet at a proper feafon, it produces a tree with all its generative parts; which it would not do were it not endued with fome feminal virtues.

This generative or feminal faculty, is a power of the vegetative foul of a plant, by which it lives and produces its likenefs for the prefervation of the fpecies: but this faculty is not difcernable from the feed itfelf, nor from the fpirit contained therein, for as the feed is faid to be a part of fome fubftance, defigned for the production of another fubftance of the fame fpecies, it is not abfolutely neceffary to diftinguifh that prolific virtue from the feed itfelf, nor from the fpirit contained in it; for after the feed is fown and foftened by the warmth and humidity of the earth, its germ (wherein the plant is contained, as in an epitome) is unfolded by a gentle fermentation, and arifes into a plant.

That the heat of the fun and the temperate warmth and humidity of the earth, are the firft principles of vegetation, appears from the fterility or fertility of the foil in thofe climates where thefe two principal agents act, or do not act, in concert; fince, in the moft northern countries, where the humidity of the foil is exceffive, and its natural warmth is too much concentered, the fermentation of the feed being made with too much precipitation, and without that gradation neceffary for the eafy and moft perfect expanfion of the different parts of the plant, thereby they are fruftrated of that ftrength they fhould have before they come out of the matrix it has been formed in to refift the injuries of the air and the inconftancies of the feafons, it perifhes almoft as foon as it appears on the furface of the earth; for although the earth has in fome meafure, though very imperfectly, acted its part (as it cannot alone, and without the affiftance of the fun, carry the plant to its laft perfection) that tender parent of nature, by the obliquity of its fituation, being reduced to the incapacity of darting its rays as favourably and abundantly in thofe climates as he does in others more happily fituated, cannot either help the mother earth in her pregnancy, nor rectify what fhe has left imperfect in her productions, which therefore die almoft as foon as nature itfelf is apprifed of their exiftence.

Likewife in thofe other climates fituated quite different from thefe where the fun, by being too profufe of its influences, penetrates the inmoft parts of the womb of the earth, and by its too violent and too often repeated acts, and exalting its falts, and evaporating its radical humidity, caufes an exceffive dilation of its pores, a difunion, and

and but too often an intire laceration of its generative parts, ſo as to render them quite ſteril or barren, and therefore incapable to contribute to that fermentation abſolutely neceſſary for the production of plants.

On the contrary, in thoſe happy climates where the parts of the earth are ſo ſituated in reſpect to the ſun as to be under his moſt favourable aſpect, and expoſed to none but his moſt benign influences, it almoſt always continues in its natural flouriſhing ſtate, being ſeldom viſited by the moſt powerful and penetrating beams of the ſun but at thoſe regular and periodical times appointed by nature for its pregnancy, when they are neceſſary to excite her fœcundity, or to nouriſh and cheriſh her productions when once brought forth.

Suppoſe our ſeed to have been ſown in this laſt ſoil, and ſituation, the firſt things which preſent themſelves to the imagination are the ſun and earth concerting together, the one by its heat, and the other by her moiſture, how to rid the embryo of that hard tough ſubſtance it is enwrapped in, and which is the greateſt obſtacle to the burſting forth of its parts; therefore the earth, which is the firſt agent in this caſe, and which is to do the office of incubation, makes uſe firſt of its natural moiſture to ſoften the outer rind or huſk, by having it percolated through the pores or pipes of the ſaid huſk, whereby they are ſo opened and dilated as to facilitate the introduction of the different ſalts appointed to operate on the whole ſubſtance of the ſeed, by unfolding the different parts it contains, and diſpoſing them ſeverally towards aſſuming their reſpective forms.

It cannot be imagined that the earth acts alone in this firſt operation, that it could direct itſelf to action without the concurrence of the ſun, which on this occaſion excites, by a gentle warmth, the different ſalts the moiſture of the earth is impregnated with, that they may be capable to conquer the ſtubbornneſs of the huſk, by forcing themſelves into its almoſt imperceptible pores, conquering all the obſtacles, and raiſing all the obſtructions which the ſeveral ſubſtances may meet with; by this means a free paſſage being opened for ſuch a quantity of the moiſture as is neceſſary to make a due ſeparation of the huſk from the more eſſential part of the ſeed, the ſalts employed in that operation being volatilized or already fixed on that eſſential part, leave the huſk filled with nothing elſe but the lympha, which groweth turgid, and being deprived of the nouriſhment it received when united to the ſubſtance of the ſeed, begins to tend towards its deſtruction.

The following procedure in the vegetation of plants is exemplified by Malpighi in a grain of wheat; the firſt day the grain is ſown it grows a little turgid, and the ſecundine, or huſk, gapes a little in ſeveral places, and the body of the plant being continued by the umbilical veſſel to a conglobated leaf (which is called the pulp or fleſh of the ſeed, and is what conſtitutes the flour) ſwells, by which means not only the gem or ſprout (which is to be the future ſtem) opens and increaſes, but the roots begin to bunch out, whence the placenta, or ſeed-leaf, becoming looſe, gapes. The ſecond day the ſecundine or huſk being broken thro', the ſtem or top of the future ſtraw appears on the outſide thereof, and grows upwards by degrees; in the mean time, the ſeed-leaf guarding the roots becomes turgid with its veſiculæ, and puts forth a white down, and the leaf being pulled away, you may ſee the roots of the plant bare, the future bud, leaves, and the reſt of the ſtalk lying ſtill hid. Between the roots and aſcending ſtem, the trunk of the plant is knit by the navel-knot to the flower-leaf, which is very moiſt, though it ſtill retains its white colour and its natural taſte. The third day the pulp of the conglobated or round leaf becomes turgid with the juice it has received from the earth fermenting with its own; thus the plant increaſes in bigneſs, and in its bud or ſtem becomes taller, and from whitiſh becomes greeniſh, the lateral roots alſo break forth greeniſh and pyramidal from the gaping ſheaf which adheres cloſely to the plant, and the lower roots grow longer and hairy, with many fibres growing out of the ſame; indeed there are hairy fibres hanging on all the roots, except on the tops, and theſe fibres are ſeen to wind about the ſaline particles of the ſoil, little lumps of earth, &c. like ivy, whence they grow curled about the latent roots, and then break out into two other little ones. The fourth day the ſtem mounting upwards, makes a right angle with the ſeminal leaf, the laſt roots put forth more, and the other three growing larger are cloathed with more hairs, which ſtraitly embrace the lumps of earth, and where they meet with any vacuity, unite into a kind of net-work; the conglobate or flower-leaf is now ſofter, and when bruiſed yields a white ſweetiſh juice, like barley cream; by ſtripping it off, the root and ſtem of the plant are plainly ſeen, with the intermediate navel-knot, whoſe outer part is ſolid like a bark, and in the inner more ſoft and medullary. The fifth day the ſtalk ſtill riſing puts forth a permanent or ſtable leaf, which is green and folded, the roots grow longer, and there appears a new tumour of a future root, the outer ſheath is looſened, and the ſeed-leaf begins to fade. The ſixth day the ſtable leaf being looſened, the plant mounts upwards, the ſheaf ſtill cleaving round it like a bark; the ſeed-leaf is now ſeen ſinuous or wrinkled and faded, and this being freed or cut from the ſecundine, the fleſh, or pericarpium is found of a different texture, the outer part, whereby the outſide of the ſeed or grain is heaped up, being more ſolid, but the inſide viſcular and full of humour, eſpecially that part next the navel-knot. All the leaves being pulled off, the roots torn, and the flower-leaf removed, the trunk appears, wherein, not far from the roots, the navel-knot bunches out, which is ſolid and hard to cut; above there is a mark of the ſheath-leaf, which was pulled, and underneath, as in an armpit, the gem is often hid; the hind part of the plant ſhews the breaking forth of the roots likewiſe, with the faded placenta, &c. After the eleventh day, the ſeed-leaf as yet ſticking to the plant, is crumpled and almoſt corrupted; within it is hollow, and about the ſecundine the mucus and white ſubſtance of the ſeed being continued to the navel-knot, forms a cavity, all the roots becoming longer, put forth new branches out of their ſides, the ſecond leaf withers, and its viſicles are emptied; the internodes, or ſpaces between the knots, grow longer; new gems appear, and the middle root grows ſeveral inches longer. After a month, the roots and ſtalk being grown much longer, new buds break out at the firſt knot, and little tumours bunch out, which at length break out into roots.

Thus, according to Malpighi, in this ſhort ſpace of time, the plant paſſes through all theſe various changes and mutations, which, though his obſervations may be real as here repreſented, yet it does not happen with ſuch celerity in all ſorts of plants, though in ſome kinds all theſe variations may come to paſs in a ſhorter time.

The plant carried thus far, it ſtill wants food for the future preſervation of its vegetative life, which being deprived of ſuch nutriment, it cannot exiſt; of which naturaliſts are ſo ſenſible, that their common opinion is, that water is the great vegetable food, which they endeavour to confirm by repeated experiments, eſpecially by that made on a ſprig of baum, mint, &c. which being ſet in a phial of pure water, without any mixture of earth, grow and put forth roots, leaves, and branches; without conſidering, that thoſe ſorts of plants being of a ſhort duration, the juices which they have received from their mother earth in their firſt formation circulating through their veſſels, being continually recruited by the ſalts the water they are ſet in is impregnated with, together with thoſe they receive continually from the ambient atmoſphere, are more than ſufficient for the ſupport of their ſhort life in the water, which ſubſiſts no longer than that the water continues to ſupply them with ſalts, of which when once exhauſted, it grows viſcous, obſtructs the pores of the veſſels, and hinders thereby the admiſſion of ſalts even from the atmoſphere, imbecillitate by degrees the functions of the vegetative ſoul, which being forced for ſome time to feed on its own ſubſtance, becomes at laſt enervated and impotent, whereby the plant withers and dies for want of food, unleſs the water is changed before it comes to the laſt period, which appears at its growing offenſive to the ſmell; even that precaution becomes uſeleſs, at leaſt for the greateſt part.

Thoſe ſalts the water is impregnated with, being heterogeneous to thoſe which enter into the compoſition of the juices, which circulate through the veſſels of the plant, have ſoon, by diſordering the whole frame of that mechaniſm, procured the extinction of the plant.

The great quantity of oleaginous particles thoſe ſorts of plants are compoſed of, which keep their pores extremely dilated for the admiſſion of ſalts and other nutritive particles,

cles, contribute much towards the production of this phænomenon; but in plants of a closer texture, whose pores are so exiguous as not to be forced, but by the impetuosity of salts exalted and volatilized, best by the warmth of the earth and the heat of the sun, this experiment is of no effect; therefore, water cannot be simply considered as the great vegetable food, although it has a very considerable share in the nutriment of plants: but were it water alone, to which vegetables owe their increase, there would be no need of manures nor changing the kinds. The rain falls in all places upon the most barren land, as well as on the most fertile; nor could there be any reason why the same field should yield a large crop of wheat one year, and not the next, since rain showers down nearly alike on the earth.

VELLING, ploughing, or cutting up the turf, or upper surface of the ground in order to its being burnt. *See the article* BURNBAKING.

VENTILATOR, a machine by which the noxious air of any close place (as an hospital, jail, ship, chamber, granary, &c.) may be changed for fresh air.

The noxious qualities of bad air have been long known, though not sufficiently attended to, in practice; but it is to be hoped, that the indefatigable pains taken by Dr. Hales, to set the mischiefs arising from foul air in a just light, and the remedy he has proposed by the use of his ventilators, will at length prevail over that unaccountable sloth or obstinacy, which, where particular interests are not concerned, seems to possess the generality of mankind, and which rarely allows them to give due attention to any new discovery.

The ventilators invented by that ingenious gentleman consist of a square box, ABCD (plate XXVI. fig. 7. about ten feet long, five wide, and two deep; in the middle of which is placed a broad partition, or midriff, made to move up and down, from A to C, on hinges at the end E, by means of an iron rod Z R, fixed to the midriff at Z.

Another box, of the same size with the former, having a like midriff, bar, &c. is placed near the former (fig. 8.) with its rod, R Z. Both these rods are fixed to a lever F G, moveable on the center O; so that by the alternate rising and depressing of the lever F G, the midriffs are also raised and depressed alternately, by which means these double bellows are at the same time both drawing and pouring out the air.

That the midriffs may be rendered lighter, they may be made of four bars, lengthwise, and as many placed across them, each about three inches broad, and an inch thick, the vacant spaces being filled up with thin pannels of fir board.

In order to make the midriffs move with greater ease, and without touching the sides of the boxes, there is an iron regulator N L (fig. 7.) fixed upright to the end A C of the box. As very little air will escape if the edges of the midriff be within one twentieth part of an inch from the sides of the box, there is no necessity for leathern sides, as in common bellows. The end A C of the box must be somewhat circular, that it may be the better adapted to the rising and falling of the midriff; and at the other end of the midriff a slip of leather may be nailed over the hinges.

To the ventilators above described, eight valves are adapted for the air to pass through; these valves are placed at the hinge-end I Q, fig. 8. numbered 1, 2, 3, 4, &c. The valve 1 opens inward, to admit the air to enter, when the midriff is depressed at the other end, by means of the lever F G; and at the same time the valve 3, in the lower ventilator, is shut by the compressed air, which passes out at the valve 4: but when that midriff is raised, the valve 1 shuts, and the air passes out at the valve 2. The same is to be observed of the valves 5, 6, 7, 8, of the other box; so that when, by the motion of the lever F G, the midriffs are alternately rising and falling, then two of the ventilators are constantly drawing in the air, and two of them at the same time are blowing it out at their proper valves, the air entering at the valves 1, 3, 6, 8, and passing out at the valves, 2, 4, 5, 7. To the ventilators, before the valves, is fixed a hook Q Q M M (fig. 9.) as a common receptacle for all the air that comes out of these valves, which air is conveyed away through the trunk P, passing through the wall of a building, &c.

It would be foreign to the intention of this work to point out the various uses of these machines in extracting foul air out of ships, hospitals, &c. but we must not omit the following:

Experiments on the preservation of corn by ventilation.

M. Duhamel caused a case, or little granary of preservation, to be made of oak plank two inches thick, forming a cube of five feet every way. At six inches from the bottom was a flooring, or second bottom, of lattice work, placed upon joists five inches thick, and covered with a strong canvas. This small granary was filled quite full of good wheat, of which it contained 94 cubic feet, weighing 5040 pounds. It was covered with good oak planks, so closely joined, that neither rats, mice, or even the smallest insects could get in; leaving only some vent-holes, with trap doors, or covers, fitted very exactly to them, as mentioned before.

This corn, laid up without having been dried at all by fire, was not ventilated more than six days in a year, which was sufficient to keep it so well that the best judges allowed it to be as good as could be. Even when the bellows had not been worked for several months, the corn was still allowed, by good judges, to look and smell perfectly well: but they objected, that it did not handle well, that is, that there was some little dampness in it. The bellows were worked for half a day, and this objection was entirely removed,

This wheat was old, and had been as well dried as any corn generally is in a common granary: therefore it being still damp, at the end of a considerable time, shews the necessity of taking away the superfluous moisture, and of reducing our corn to the same degree of dryness, as that of the hottest countries, in order to preserve it in great bodies.

Experiment on ninety-four cubic feet of wheat.

In May, 1743, ninety-four cubic feet of wheat were put into one of the little granaries before-mentioned. It was of the harvest of 1742, of an excellent quality, perfectly clean, and so dry, that a small parcel of it which was put, for a trial, into a stove heated to fifty degrees of M. de Réaumur's thermometer (123 of Farenheit's) lost but one sixteenth of its weight. This wheat was well cleansed from dust, and deposited in the granary without being dried by fire.

During the first three months, it was ventilated for eight hours once a fortnight: during the rest of the year 1743, and all 1744, it was ventilated once a month: all the year 1745, and part of 1746, it was ventilated half a day once a month; and after that, but once in two or three months.

In June 1750, the granary was emptied, and the wheat looked and smelt very well, but felt a little rough in the hand, because, not having been stirred for six years, the little hairs that are at the extremity of the grain, and the particles of the bran, were roughed up: but after passing twice through the wind screen, that objection was entirely removed. *See the article* THRASHING.

This corn was eight years old, during seven of which it was preserved in one of M. Duhamel's small granaries, without any sensible diminution, and without any damage from vermin or insects: we cannot say absolutely, without any expence, because a man was employed from time to time to ventilate it. But this was a very trifling charge, and may be reduced almost to nothing, by working the bellows with swifts like those of a mill.

Experiment on seventy-five cubic feet of new wheat, extremely moist, grown, and which had already contracted a bad smell.

The harvest of 1745 was very rainy: almost all the wheat of that year was grown in the ear; the sheaves were extremely wet when they were housed; the grains adhered so closely to their husks, that they were greatly bruised by the flail; and if they were left but a very little while upon the barn-floor, before they were cleansed, they heated, and contracted a smell like that of pigeon's dung: in short, they were so very moist, that they lost an eighth part of their weight when dried in a stove heated to fifty

fifty degrees of M. de Réaumur's (one hundred and twenty-three of Farenheit's) thermometer; and when laid up in the common granaries, in the usual way, they were always in a state of fermentation, though but a foot thick, and turned every fourth or fifth day.

Seventy-five cubic feet of this grown wheat, which smelt very ill, and was so moist as to wet the floor of the granary where it laid but a few days, were put, in this condition, and without being dried by fire, into one of M. Duhamel's little granaries, with small hopes of success.

As this corn was very hot when put into the granary, it was ventilated three or four times the first week, and once a week during December and January: and as it had then lost great part of its bad smell, it was ventilated but once a fortnight from that time till June. Then perceiving, by thrusting his hand into the top of the heap, that it heated, and concluding that it was going to be entirely corrupted, M. Duhamel ordered the granary to be emptied: but after the depth of about a foot had been taken from the top, he was greatly surprised to find the rest cool, with very little bad smell, and drier than that which was preserved in the common granaries.

The reason why the top of this corn was the worst, was, undoubtedly, that the moist vapours were always forced upwards in ventilation. It therefore might, perhaps, have been kept very well, if, instead of emptying the granary, it had been ventilated oftener: for this would, probably, have dried away the remaining moisture, even at the top, as the following experiment will shew. But however that might have been, this teaches us one important thing, which is, that the top of the heap is most subject to heat in this sort of granary: so that if the grain taken out of the vent-holes is in good condition, it may be concluded that the rest is still better.

Experiment on five hundred and fifty-five cubic feet of wheat, very damp, mixed with smut, and which had contracted a bad smell.

The wheat of the year 1750 grew in almost continual wet; the harvest was very rainy; and the same weather continuing all the year 1751, no pains that could be taken to turn the corn laid up in the common way, could dry it, or prevent its heating and contracting a bad smell. The wheat of this crop was likewise mixed with a considerable quantity of blighted and smutty grains, which always contain a great deal of moisture, doubly difficult to be exhaled from them, and which soon makes them contract a bad smell, which they speedily communicate to the sound corn.

Five hundred and fifty-five cubic feet of this wheat were deposited in one of M. Duhamel's granaries of preservation, after being cleansed with such perfect care, that scarce any mark remained either of blight or smut among it; though these faulty grains amounted to near a sixth part of the crop. But there still remained a fine dust, or powder, occasioned by the moisture, so closely adherent to the corn, that it could not be taken off by any means.

This wheat was laid four and a half or five feet thick in one of these granaries, the bellows of which were worked by a wind-mill; and as there was no want of wind during all the year 1751, and till the spring of 1752, the corn was often ventilated, without trouble or expence; by which means it was not only well dried, but also cleared of great part of its bad smell. It was indeed, when taken out of the granary, very full of dust, which had fallen off the grains as their moisture was exhaled: but this was then easily separated by proper screening, and the wheat proved so good, that the bakers bought it at the highest market price.

This experiment proves, that even very moist corn, which has a great disposition to ferment, may be preserved by ventilation only: and as to the smutty grains with which this was mixed, the reverend Dr. Hales, after rightly observing that kiln-drying is apt to make wheat grind unkindly, proposes the following method of drying smutty corn, after it has been washed; cold air not hurting it, as kiln-drying is found to do. "That I might be well assured, says that friend to all mankind, of the good effect of thus drying smutty corn; having procured a quantity of very smutty wheat, which weighed seven pounds and fifteen ounces, on the twenty-sixth of May, at five in the morning, it was washed clean in four several waters, which was done in a few minutes, and was then laid to drain in an oat-sieve, till half an hour after five, when it had increased in weight, by wetting, ten ounces, besides the moisture that was equal to the weight of the smut-balls and smut that was washed from the wheat. It wasted but two ounces and an half, by the first two hours ventilation; two ounces and five drachms in the second two hours, viz. from eight to ten; in the next six hours, viz. from ten to four in the afternoon, it wasted at the rate of four ounces every two hours; from four to six, two ounces and an half, and from six to eight, one ounce and an half: in all, about twenty ounces; some allowance being made for what corn was wasted by handling and biting some of it from time to time. It was ventilated in these fourteen hours with about forty thousand gallons of air, which passed upwards through it, and made it sufficiently hard and dry, so as to be fit for grinding: it was well coloured, and handled well; and, from stinking, as smutty wheat does, it became much sweeter. The visible dewy moisture was blown off in three hours; but it continued damp and cold to the feeling till two o'clock, when some little dust began to fly off it.

"And whereas it wasted off much less moisture during the first four hours ventilation, when it ought to have wasted the most, on account of its being then wettest, this was owing to the foggy haziness of the morning: which as it went off, and broke out into fine warm sunshine, towards ten o'clock, so the air being thereby become dry, it imbibed moisture more strongly from the corn: and that this was the true case of the difference, is farther confirmed by a like experiment which I had before made on a gallon of wheat, April the first, there being then a very dry north-east wind.

"It will be advisable to begin to ventilate corn as soon as possible after washing, that the moisture may have the less time to soak in: for the less moisture soaks in, so much the sooner the corn will dry.

"If the moisture is so easily carried off from wet wheat, by ventilation, this method will doubtless much improve what is called cold wheat, viz. such as is grown, and has been housed in a cold wet season; and will therefore soon carry off the moist vapours which arise from corn, and which cause it to heat and grow musty."

Other experiments on the preservation of corn by ventilation.

The prior of the royal abbey of St. Stephen in Caen, filled a granary of preservation twelve feet wide, thirteen feet long, and six feet deep, which forms a parallelipipede of nine hundred and thirty-six cubic feet, constructed according to M. Duhamel's directions, with wheat that had been kept all the winter in a common granary. It was cooled from time to time by two bellows, which two men worked by means of a leaver; and though the place where this granary of preservation stood, was neither so dry nor so airy as might have been wished, the corn kept perfectly well in it.

In the beginning of September 1754, M. Vandusfel filled one of M. Duhamel's granaries of preservation, seven feet square and six feet deep, with good wheat, undried. It heated a little at the end of eight days; but two men, with a small double ventilator, cooled it in two hours time. It began to heat again about a week after, when he repeated the same operation, which cooled it presently. By the twentieth of October it was quite cool, though it had not then been ventilated for fifteen days; and according to a letter of his writing to M. Duhamel, dated the fourteenth of October, 1756, it still continued in the same good condition. Corn of the years 1754 and 1755, not dried, but only ventilated, had likewise kept with him as well as could be wished.

VERJUICE, a liquor obtained from grapes or apples too acid for wine or cider. It is generally made in England from the juice of the crab, or wild apple.

VERMIN, a collective name including all kinds of small animals, that are troublesome to men, beasts, corn, fruits, &c.

VERNAL, something belonging to the spring season.

VERTICULATE *Plants*, such as produce their flowers round the joints of the stalks in whorles; as hyssop, mint, thyme, &c.

VETCH, the name of a well known plant, much cultivated in many parts of England, and of which there are feveral fpecies.

Some forts of this plant, the feeds of which ripen in autumn, grow naturally in moft parts of England, in fhady places among bufhes, and by the fides of woods. The roots of thefe are perennial; but their ftalks are annual, weak, and grow to fo great a length (for they will climb up to the height of fix or eight feet wherever the tendrils which proceed from the end of their leaves can lay hold of boughs, branches, or the fide of a hedge, to fupport them,) that they are hardly fit to be cultivated in the field, though fome writers have recommended them for this purpofe: for as they cannot be fupported there, they will trail fo much upon the ground, that they will be apt to rot: nor do their fhoots, which are lefs fucculent than thofe of the vetch commonly raifed, grow to a fufficient height to be cut for ufe till late in the fpring, when there is little want of green food for cattle.

Mr. Miller, after fowing for many years the common vetch or tare, which is much cultivated in the fields for fodder, feems to think that which has black feeds, a diftinct fpecies from the white: for he has never found either of them vary. Both thefe are annual, and perifh foon after they have perfected their feed. Their ftalks are angular, ftreaked, and hairy: they are weak, and want fupport, and generally trail upon the ground when they do not find any thing to faften themfelves to. Their leaves are compofed of feveral pair of blunt lobes, and are terminated by tendrils. The flowers, which are pretty large, proceed from the wings of the ftalk, and fit very clofe to the bafe of the foot ftalks of the leaves. Two of thefe flowers generally fpring from the fame joint: thofe of the black feeded fort are purple, and thofe, of the white feeded are white. They appear in June and July, and are fucceeded by erect pods containing three or four round feeds in each, which ripen in Auguft and September.

The white vetch is rather the more fucculent plant of the two, and therefore it is beft for fodder: but many are unwilling to cultivate this fort, becaufe their feeds, being white, are much fooner difcovered by rooks and other birds, than thofe of the black, which bear a nearer refemblance to the colour of the ground. This objection may, however, be eafily removed, by fowing them in drills, and then covering them carefully, inftead of the ufual method of fcattering them with a broad-caft, and plowing them in lightly.

The fmall black-feeded vetch, which fome call rathripe, and others pebble, goar, or fummer vetch, is much tenderer than either of the former, and therefore lefs cultivated. This muft always be fown in the fpring: whereas the others may be fown in fpring or autumn.

But another fpecies of vetch, viz. the Siberian, hardly known, to the generality of farmers in this country, bids fair to become, perhaps, the moft ufeful of all for fodder; for its ftalks grow to a great length, and are well furnifhed with leaves, which do not decay in autumn, like thofe of the other forts, but continue green all the winter, in defiance of the hardeft froft: fo that in February and March, when there often is a fcarcity of green fodder for ewes and lambs, this may be of fingular fervice, efpecially if thefe plants are fupported from trailing upon the ground. Their flowers, which appear in July, are of a light blue colour.

This, like our common vetch, may be fown in the fpring, or in autumn; and when the plants are come up, they will not require any other culture than keeping them clear from weeds; a work which, if the feeds are fown thin in rows four feet afunder, as Mr. Miller rightly advifes, may be eafily done with the Dutch hoe, while they are young, and afterwards with the hoeing plough. By this thin fowing, the ftalks of thefe vetches, which fend out many branches, and extend very far, will be kept from matting fo clofely together as to rot each other by excluding the air; and by earthing up their ftems in the fame manner as fhould be done for peas and beans, they will be greatly ftrengthened, their leaves will grow the larger and more fucculent, and they will confequently yield an increafed quantity of fodder. The repeating of this as often as it may be found neceffary to deftroy the weeds in fummer, which may be done at a very fmall expence, and is particularly proper when the growth is intended for the green food of cattle, will be attended with the farther important advantage of preparing the ground thoroughly for whatever other crop may afterward be put upon it.

As the plants of this kind of vetch will not be in danger of being hurt by froft, they fhould not be cut till the fpring, when the beft way will be to take them as they may be wanted, green, for the feeding of ewes: but fome of them fhould be left untouched, for feeds; for if thofe which are cut do fhoot out again, they will flower fo late in fummer, that their feeds will not ripen, unlefs the autumn proves very warm. A better way will therefore be to fow a proper quantity of feeds for this purpofe in a feparate fpot of ground: becaufe, when the other is cut, the ground may be plowed for other crops; and if the feafons fhould be fo mild as to produce a fufficiency of green food independent of this, the vetches may be plowed into the ground, to which they will be an excellent dreffing for other crops.

Mr. Miller, who has a high opinion of this fort of vetch, and whofe recommendation of it ought to have very great weight, is now beginning to try it in the field, where he has not yet had experience of its culture: but the experiments which he has made with it for fix years paft, on fmall patches of it fown in gardens, in different fituations, have fully anfwered his expectation: for he has found thefe plants continue in great verdure in all thofe places, when moft of the perennial plants in the fame fituation have fuffered greatly by the froft, and could have cut from only eight of them as much fodder as would have been equivalent to half a trufs of clover.

Vetches are generally fown either in autumn, or early in the fpring: but the beft time, in this country, is toward the beginning of Auguft; becaufe the rains which ufually fall about that feafon will bring them up in a fhort time, and the plants will get ftrength before winter, and be fit to cut for the food of cattle early in the fpring, when green fodder is moft wanted: and if they are defigned for feed only, thefe early fown vetches will come early into flower, and their feeds will ripen early, fo that they may be cut and ftacked in good weather, which is a great advantage; for thofe which ripen late, are often ftacked or houfed wet, and then their feeds frequently fprout in the mow, and are fpoiled.

Vetches will do well in almoft any ground; not excepting even fuch as can fcarcely produce any other plant. The common method of fowing them is in broad-caft, ploughing them lightly in, as was obferved before; and the ufual allowance is two bufhels of feed for an acre of land; though fome fow two bufhels and an half. Either of thefe practices may do well enough for thofe vetches which are intended to be cut for fodder in the fpring; but when they are fown with a defign to let them ftand for feed, it will certainly be much better to fow them in drills, in the fame manner as is practifed for peas; and in this cafe lefs than half of the abovementioned quantity of feed will be fufficient: for the rows fhould be at leaft three feet afunder, that the hoe-plough may have room to go between them, to deftroy the weeds, and earth up the plants, which, when thus managed, will produce a much greater crop, and ripen better and earlier, than in the common way. Thefe drills fhould be of about the fame depth as for peas, and the feeds fhould be fcattered at about the fame diftance in the drills, in which they fhould be carefully covered over as foon as they are fown; for otherwife the rooks will difcover them; and when thofe voracious creatures once find the rows, they will fpeedily deftroy them intirely, if they are not carefully watched. The preventing of this is another advantage which attends the fowing of vetches early in autumn, rather than in the fpring: becaufe there is more food for rooks and pigeons in the open field in the former of thefe feafons, and the plants will then appear much fooner above ground. Toward the end of October, by which time the plants will have acquired confiderable ftrength, the horfe-hoe fhould begin to work between the rows, provided the weather be dry: and in doing this, particular care fhould be taken to lay the earth up as high to the ftems of the plants as can poffibly be, without covering their tops. This will help to fecure them againft froft, and clear the ground of weeds at leaft till March, when the plants fhould be earthed up a fecond time, and the intermediate fpaces between their rows be cleaned again, in the fame manner as before. This will make them grow fo vigoroufly, that they will meet and cover thofe fpaces in a little time: whereas thofe fown in the fpring will not grow to half this fize, and will be very late in flowering.

When vetches are intended only for fodder, of which they generally afford two good crops in the year, in hot countries, or when the farmer defigns them for plowing in, by way of manure, they need not be fown in drills, or hufbanded in the manner directed: the common broad-caft way will then do well enough: but ftill it is moft advifable, in either cafe, to fow them early in autumn; becaufe, in the firft place, they will produce the defired green fodder much earlier in the fpring; and in the fecond, they will be fit to plow in much fooner the following year, and thereby have time properly to meliorate the land, and prepare it to receive the enfuing crop, which they are generally allowed to do even more effectually than peas. Stiff clays are peculiarly benefited by this dreffing: but it furely is bad hufbandry to fow vetches for green fodder, where lucerne will thrive; becaufe this laft will yield greater plenty of ftill more nourifhing food.

In fome countries, efpecially abroad, they mix oats with their tares or vetches, an equal quantity of each, and fow them in February. The vetch, fupported in fome meafure by the oat, grows the higher for it: and, about the middle of May, this mixture is mowed, and given to horfes and other cattle, which it fattens greatly. Mr. Mortimer likewife thinks it a good way to fow horfe-beans and tares together: their feeds are eafily parted with a riddle: and another obfervation in which he agrees with the Maifons Ruftiques, is, that more vetches fhould not be fown at any one time, than can be covered the fame day, becaufe the dew is apt to fpoil them: confequently they fhould not be fown till two or three hours after the rifing of the fun; by which time the moifture will be exhaled from off the furface of the earth. But though their feeds cannot bear dampnefs, which would foon rot them, their plants, efpecially in fandy land, often perifh in dry years, for want of water. To make them flourifh well, they require a fhower of rain every ten or twelve days. One plowing to turn in the ftubble of the preceding crop, and another at the time of fowing, are fufficient for this plant: but thofe who give only one plowing, which is when they fow, and afterwards harrow in the feed, neither have, nor can expect, an equally good return.

When vetches are cultivated for their feeds, they fhould be cut foon after the pods turn brown, and ftacked as foon as they are dry: for if they are fuffered to lie out in the field, till they receive wet, and there then comes a hot day, moft of the pods will burft, unlefs they happen to have been blighted; in which cafe they will not open fo eafily. Their haulm, when dry, and threfhed, is efteemed good food for cattle, and fome fay that their feeds are as good for horfes, as beans; which, if true, fhould render them the more valuable, becaufe thefe will grow on the lighteft fandy land, where beans will not thrive; and may therefore, as Mr. Miller obferves, be a good improvement to fome counties in England where they do not even attempt to cultivate the bean. About three loads from an acre are reckoned a good crop.

Vetches, when threfhed out, will be as good for fowing at the end of five or fix years, as at firft, if care be taken to turn them in the heap from time to time. Mr. Mortimer cautions the hufbandman to lay them by themfelves in fome convenient place, feparate from his other corn, becaufe they will otherwife be apt to foul it.

It is commonly faid, that the farmer cannot fow any thing more profitable than vetches; for that, befides inriching the land, a load of them will go farther than two loads of hay: but Mr. Lifle has a calculation tending to prove, that an acre of broad clover is worth twenty fhillings a year more than an acre of any vetches, and that the clover fhould therefore be preferred, wherever the ground will bear it well.

" It would certainly, fays Mr. J. Smith, an ingenious farmer of Effex, be of great national advantage, could our ftock of cattle and fheep be encreafed without diminifhing the quantity of our lands that are in tillage.

" This can no otherways be done, but by encouraging the growth of artificial paftures, which the farmers have of late years fallen into.

" The turnip hufbandry is not of very old ftanding in this ifland, yet has it made a very rapid progrefs. The immenfe utility of it, when properly practifed, cannot but be evident, even to an ignorant common farmer, on the flighteft infpection. This evident utility of it has occafioned its being almoft univerfally practifed in the counties of Norfolk, Suffolk, and Effex, whence it has fpread to other parts of England, and is of late even adopted in Ireland, where, I am informed, the gentry are very intent on improving their eftates.

" The colefeed plant has alfo its utility, and in many places is as univerfally fown as the turnip. I have, myfelf, very often raifed this crop, as well for feeding fheep, &c. as for the fake of its feed, and have had no little fuccefs in this hufbandry, being very fond of it, as colefeed is an excellent crop to overpower, choak, and deftroy weeds.

" I wifh the burnet grafs, fo ftrongly recommended, may anfwer every purpofe that is expected from it: it feems to promife very fair from the accounts given of it by Mr. Rocque; and if it has not too much prejudice to encounter withal, it may probably fucceed, and the culture of it become as univerfally adopted, as is that of the turnip, or colefeed plant, already mentioned.

" So much in general; but the particular reafon of my now writing to you, was to recommend to the induftrious farmer the cultivation of vetches as food for cattle.

" I have often fown this crop with great fuccefs, to prepare my land for wheat, and have always found that by growing to a large cover they deftroy and choak up a great number of weeds, which would otherwife do me immenfe damage: indeed, I think them, for this purpofe, next in rank to a hoeing crop.

" When I fow vetches before wheat, I always, in the fpending my crop, have regard to the condition of my land. If my land is not in good heart, but wants mending, I not unfrequently fold my fheep on it, and feed off my crop in the field; but if it is inclined to be rank, or the wheat which is fowed on it, is apt to run much to ftraw, I often cut my vetches green, and feed my horfes in the ftable with them. I find no food agree better with them; they thrive well, grow fat, and are always in good health and fpirits when thus fed.

" I fometimes alfo mow my vetches when they are in bloom, and make them into hay, in the fame manner I manage my clover and meadow grafs; all which I leave in grafs cocks in the field, whilft it is haying, very feldom fpreading it, for fear of rain; and after two or three turns it is generally fit to carry.

" The great art, in making hay of vetches, is to contrive in fuch fort, that the leaves do not drop off the plants, which, if left too long, or dried too fuddenly, they are apt to do; and the farmer is to underftand, that great part of the peculiarly nourifhing quality of the hay refides in the leaf.

" I fay peculiarly nourifhing, becaufe almoft every kind of cattle, as horfes, oxen, cows, and fheep, is fond of it, and they all thrive on this food amazingly: this I have often experienced, and moreover obferved, that they make no wafte even of the ftalks, which they eat with an appetite.

" In this manner I manage for my hay, when I am inclined to have it very fine and fit for my cows and fheep; and in this manner it is no difficult matter to get it in in good order, fweet, and wholefome: but when I intend it only for my horfes, I generally let my crop ftand fomething longer; that is, till the kid, or pod, is formed, and the feed about half grown within it.

" When the hay is made in this laft way, the bufinefs is much more ticklifh, and conftant obfervation muft be made to fee when the crop is in proper order to cut, becaufe if it is left too long, the ftalks grow hard and fticky, and the leaves are apt to drop off.

" This hay is more nourifhing, when cut in this laft method, than I can well defcribe: it anfwers both for hay and corn; and with this food my horfes will be in good flefh, health, and fpirit, and be able to do a great deal of work.

work. I have often proved this to be true, and can therefore the better venture to assert it.

"I have still another method of making these vetches into hay, which is to leave the crop, till the seed is grown to its full size in the pod, though not ripe: I then mow them, and, when dry, thresh them on a cloth in the field; by which means I procure a considerable quantity of pigeons meat, which fetches me a tolerable good price; and this pigeons meat sells better at market, than if the vetches had stood till the seed was thoroughly ripe; for by cutting the crop when the seeds are barely full grown before they begin to harden, they shrink in the drying, and thereby become of a smaller size than they are by nature, and consequently more proper food for pigeons than if they were larger.

"I own, the hay in this last method is not quite so good, as many of the leaves will, in spite of all the care that can be taken, drop off, and the stalks will be a little sticky: yet, after all, it serves very well for my ordinary cattle, and even for my plow and cart horses, with the assistance of a few oats.

"Vetches are a very good plant to sow thick on land, and when they have formed a perfect cover, to plow them in, in order to the land's being sown afterwards with wheat on one plowing. In this intention they answer to the full as well as buck-wheat, or clover.

"When a farmer intends to plow in his vetches, I would by all means advise him to do it some weeks before he sows his wheat, that they may have time to ferment and rot, or the consequences may be fatal to his crop: I once, myself, lost the chief part of a fine field of wheat by this oversight." *Museum Rusticum, vol.* II. *pag.* 169.

"Vetches, says a gentleman farmer of Surry, are a grain often overlooked by the farmer; yet are they, when properly cultivated and applied to proper uses, highly valuable and very beneficial.

"They are a very hardy grain, and resist the severity of a severe winter better than most other crops; besides which, they have the additional advantage of growing in almost any soil; but then the farmer is to expect a produce in proportion to the goodness of his land.

"I would by all means advise, where it is intended for early seed, or to stand for seed, that the small winter vetch be cultivated in preference to every other sort, because it is not only hardier, but also, being sown about Michaelmas, it is forwarder, to serve as fodder, or will be earlier ready to mow for seed, which is no inconsiderable advantage; for the vetch being a succulent plant, and forming a very thick cover on the land where it is a full crop, it will be in danger of rotting instead of drying, if it should be cut late, or the harvest weather should be very rainy; but if the winter vetch is sown early, it will, in general, be fit to mow in July, or the very beginning of August, when there is less danger.

"Few farmers allow more than one ploughing for vetches: I always allow two, notwithstanding what the neighbouring farmers tell me of turning the fresh soil again down to the bottom of the furrow: I find my advantage in this practice, and shall therefore continue it.

"I have generally experienced the first week in October, if the weather is fine, to be the very best time for sowing vetches; and I allow only two bushels of good seed to every acre, which I find full sufficient.

"I sow them broad-cast on the rough land, as the plough leaves it after the second ploughing, taking care to harrow the field length-ways and cross-ways, in order to cover the seed the better; after which I pass over it a roller, heavier or lighter, according to the nature of soil and the dryness of the weather, observing, that if the weather is dry, and the soil light, I use a heavy roller, in order to close the pores of the light earth; but if the soil is stiff, and the weather damp, I use a lighter roller, lest I should knead and crust the field over, so as to stop the young shoot of the vetch.

"This crop will, in general, choak all the weeds that come up with it; but this must, however, be understood of the smaller sorts, for if there are many large rampant weeds, it will be necessary to have them extirpated with the hook.

"Vetches afford excellent food for sheep in the spring, make cows give a great deal of good milk, and horses are fonder of them, cut green, than almost any other food.

"The best way is to cut them fresh and fresh every morning as they are wanted; and if the farmer has occasion for them for this use only, he may sow in the spring, to great advantage, the large vetch, at different times; by which means he will have a succession of crops, which, to give green to his cattle, he should always cut just before the plant flowers, for it is then in its tenderest and most succulent state, and will afford most nourishment; whereas, if he leaves it till the seeds are nearly ripe, the stalks harden, grow sticky, and are of far less value; besides that many of the lower leaves will, by this time, be withered, or dropped off, and entirely lost.

"I must not conclude without mentioning an important use to which vetches are often applied; I mean, a full crop of them is frequently ploughed into the land as manure, to prepare it for a succeeding crop of wheat.

"When vetches are sown with this intention, I would recommend the large sort, and that four bushels of good seed should be used, to be sown broad-cast twice in a place: but my way of sowing it is somewhat peculiar when I mean to plough it in; therefore I think it may not be amiss to relate it.

"Most farmers sow it by casting it twice in a place, immediately after the land is ploughed, and then harrow and roll the field; but I proceed as follows.

"As soon as the field is plowed, I sow two bushels, broad-cast, on every acre; after which I harrow it length-ways and cross-ways. When this is done, I sow the remaining two bushels, and then harrow it twice again with a pair of heavier harrows, and finally scratch it twice over with light harrows to raise a mould, concluding my work by passing a roller over the whole field. By this management I scarcely ever miss of a full crop, which covers the whole land, choaks the weeds, and serves as excellent manure for the wheat that is to follow.

"I have always found that this husbandry succeeded best in light, hungry, sandy, or gravelly loams; and a brother of mine, who lives in Bedfordshire, tells me it does very well on a chalky soil, provided there is any heart in it.

"The time I choose to plough in the vetches is just after the blossom fades, and the kid begins to form; and it is really surprising to see what a strong fermentation they raise in the soil.

"I have sometimes had my crops so heavy that I have been obliged to mow, or hook up, the vetches before I could plough the land: but this is not often the case; when it is, the farmer has reason to rejoice.

"There are, as I hinted in the beginning of this account, scarcely any soils but the vetch will thrive in, though ever so various in their nature. I am an old man, and in the course of many years experience have sown vetches often on a sandy and gravelly loam, a chalk, though not for ploughing-in, a gravel, a low damp clay, and a perfect brown loam. On all these varieties of soil have they succeeded with me; but I must note, that the farmer may expect a larger crop from a gravel (I do not mean a pure gravel) that has some heart and strength in it, than from the finest loam, which has been, by a long-continued course of bad culture, starved and impoverished.

"The large vetch may be sown in January, February, March, April, or even the beginning of May, when designed for green fodder; but I would, by all means, have the industrious farmer avoid sowing it before Christmas, for it is a tender plant, and if hard frost ensue, he may chance to lose his crop." *Museum Rusticum, vol.* III. *pag.* 185.

VINDIMATION, the gathering the grapes, or vintage.

VINE, the name of a well known shrub, which is, with good reason, preferred to all other, not only for the sweetness of its fruit, but also for the ease with which it answers the labour bestowed upon it, almost in every country and every latitude in the world, except in the frozen or the torrid zones.

It grows as happily in plains as upon hills, and thrives as well in a strong soil, as in that which is loose and open; also in land that is poor, as in that which is rich; and in a dry soil, as well as in that which is naturally moist. It

alone

alone beſt endures the intemperature of heat, cold, or ſtormy weather.

Nevertheleſs, it is of great importance that the quality of the vine be adapted to the condition of the country: for neither is the culture the ſame in every ſoil and climate, nor are all vines of the ſame kind. It is not eaſy to ſay which is the beſt; experience teaching us, that every country has its own, which is more or leſs proper for it. A judicious huſbandman will however eaſily find, that that vine is proper for the plain, which bears fogs and hoar-froſt without being hurt; and for a hill, that which can bear drought and wind. He will plant in a rich and fertile ſoil, a ſlender vine, which does not bear plenty of fruit; in a ſtiff ſoil, one that makes ſtrong ſhoots and is covered with plenty of leaves; and in a looſe ſoil, one that makes but few ſhoots. He will find, that it is not proper to commit to a moiſt place a vine which bears tender and large grapes; nor to a dry place, a vine of a contrary quality.

The good huſbandman will alſo know, that the nature of the climate is of great conſequence; whether it be hot or cold, wet or dry, ſubject to hail and wind, or calm, clear, or cloudy. Two ſorts of vines are fit for a cold and cloudy ſituation, viz. either one which is early, and ripens its fruit before the winter; or one of firm and hard grapes, which bloom in the midſt of fogs, and afterwards mellow with the cold and hoar-froſt, as other grapes do with warmth. Where wind and ſtorms are frequent, the vines muſt take deep root and have hard grapes: where the ſituation is warm, they may be of more tender and more fruitful kinds. Vines whoſe grapes rot with rain and conſtant dews ſhould be planted in dry places; and thoſe in moiſt, which are hurt by drought. If any vines are planted in places ſubject to hail, it ſhould be thoſe which have large and ſtrong leaves; becauſe they will ſhelter the fruit. Where the ſky is uſually ſerene and fair, all ſorts of vines will grow: and thoſe may be planted to advantage, whoſe grapes fall quickly off.

Could we have the quality of the ſoil, the ſituation of the place, and the ſtate of the weather to our wiſhes; that ſoil ſhould be preferred, which is neither too ſtrong nor too looſe, but rather inclining to looſe; neither poor, nor exceeding rich, but rather fertile. The ſituation ſhould neither be a plain, nor ſteep, but yet on a riſing ground; it ſhould neither be wet nor dry, yet moderately moiſtened with dews: it ſhould neither have ſprings on the ſurface, nor at ſome depth in the earth; and yet it ſhould communicate to the vines a moiſture which is neither bitter nor ſalt; for either of theſe will vitiate the taſte of the wine, and give a ſcurvy rough coat to every plant that grows on ſuch land. The ſtate of the moiſture may be known, by diſſolving ſome of the earth in water. The vine does not proſper either in a frozen, or in a ſcorching hot climate; but it thrives beſt in a country that is rather warm than cold. It is hurt more by rain, than by dry weather, and proſpers better in a dry climate, than where rains are frequent. It delights in gentle and moderate gales, but is greatly damaged by ſtorms.

It is an obſervation of long ſtanding, that ground which has never been plowed, or had trees growing on it, is the beſt for a vineyard. All authors agree, that an old vineyard is the worſt of any for making a new plantation; becauſe the earth is entangled with the old roots of the vines matted together, poiſoned by their decay, and quite exhauſted by their long ſtanding. Wood-lands may be uſed, becauſe the roots of common trees and ſhrubs are eaſily extirpated. Where there is no unplowed land, the next beſt is a corn field, free from trees, or where trees have not been planted thick.

The fitneſs of new ground for the vine may be judged of by the ſhoots of ſuch ſhrubs as grow naturally in it: for if they make thriving ſhoots, which have not a ragged or ſtinted appearance, the vine will flouriſh there. Of all ſoils, a black rich mould is the beſt for vines. Stones which crumble, or rot as it were, with the weather, being broken, and laid to the roots of the vines, retain a moiſture, cool them, and, by that means, are exceeding fit for nouriſhing them. For the ſame reaſon gravel, pebbles, and looſe ſtones are approved of, provided they be mixed with rich mould: but if they are mixed with poor earth, they are bad. Flints are likewiſe very friendly to vines, if covered with a moderate depth of earth; becauſe, being cold, they retain the moiſture, and prevent the roots being parched up in the dog-days. The foot of mountains, which receive the earth waſhed down from their tops; or vallies, to which additions are made by the ſettling of rivers, which overflow them, are very proper for vineyards. A chalky bottom is fit for the vine; but clay, not excepting even that which approaches to marle or potter's clay, is very unfit; as is alſo coarſe hungry ſand. On mountains and riſing grounds, and on the ſides of hills, vines do not eaſily take firm root; but they yield wine of a laſting and excellent flavour. In moiſt and level places, vineyards are exceeding ſtrong; but they produce wine of a weak flat taſte, which does not keep long.

It may be eſtabliſhed as a general rule, to plant vineyards in cold countries ſo as to face the ſouth, and in warm countries facing the eaſt, unleſs they are ſubject to ſtorms from that quarter, in which caſe it is better that they face the north. In exceeding hot countries, ſuch for example as Egypt, it will be beſt to expoſe them to the north.

Mr. Miller ſays, that the beſt ſoil for a vineyard, in England, is that whoſe ſurface is a rich ſandy loam, and not above a foot and an half. or two feet deep, lying upon gravel or chalk; either of which bottoms is equally good for vines. If the ſoil is deep, or the bottom either a clay or ſtrong loam, it is by no means proper for this purpoſe: for though the vines may ſhoot vigorouſly, and produce a great quantity of grapes; yet we have not ſun to ripen them ſufficiently. If the ſoil is too deep, the roots of the vine will run to too great a depth to receive the influences of the ſun and air; whence the juices of their fruit will be crude.

According to him, our vineyards ſhould be planted on the north ſide of a river, upon an elevation inclined to the ſouth, with a very gradual deſcent, that the ſuperfluous moiſture may be the better drained off. Yet if the ground ſlopes too much, it is by no means proper for this purpoſe. Hills to the north, as they ſhelter the vineyard from cold, and reflect the heat, will be of great advantage. The country round about ſhould be open and hilly, to preſerve the air dry. The vineyard ſhould be open to the eaſt, that it may enjoy the morning ſun, to dry up the ſuperfluous moiſture.

Dr. Beal, in N°. 116 of the Philoſophical Tranſactions, after having mentioned ſome inſtances of the warmth ariſing from ſtones under ground, eſpecially lime-ſtone, and ſome kinds of pebbles, is of opinion, that, as I obſerved before (quoting this very paſſage more at large), many of our hills and rocks might be greatly improved: for it would be no hard taſk, ſays he, to ſhovel down the ſhallow and moſſy turf from the ſteepeſt declivities, into places, where it may have ſome receptable or ſtay; and there to impregnate it, with the ſpade and compoſt, for garden or vineyard.

The ground muſt firſt of all be cleared of the roots of trees or ſhrubs, or whatever elſe can be a hindrance to the diggers, or might afterward preſs down the trenched earth, by its weight, or by the treading of thoſe employed in carrying it off. It is of great importance that the earth be kept extremely looſe, even, if poſſible, without a foot touching it, in order that the mould, being all equally ſtirred, may eaſily give way to the young tender roots, wherever they extend themſelves, and inſtead of obſtructing them by its hardneſs, receive them into its tender nouriſhing boſom, which, in that ſtate, readily admits the ſhowers and other influences from above, and diſpenſes them equally to all parts, for the nouriſhment of the young plants.

A plain or valley muſt be trenched two feet and an half deep, and a riſing ground three. A ſteeper hill muſt be trenched four feet deep: for when the mould is turned down from a higher place, it can hardly be thrown up again to a ſufficient depth, unleſs the trenches are made deeper. Beſides, I never approve, ſays Columella, of planting a vine leſs than two feet deep, even in a valley; for it is better not to plant it all, than to leave its roots too near the ſurface ſuſpended from the nouriſhing moiſture, which lies low, except where ſprings riſe near the ſurface: there indeed the ground muſt not be trenched above a foot and an half deep.

The trenches muſt be made equally deep all the way to the bottom, the ſides being perpendicular, and the ground marked out by a line, which muſt be carried forward as the work proceeds, always at equal diſtances, till the whole ground is equally trenched. Where the bottom is of a binding nature, it is of great advantage to lay in the bottom of the trenches, ſmall ſtones, or other rubbiſh, to carry off the water, which otherwiſe, ſtagnating there, would chill the tender roots. In order to do this the more effectually, the bottom of the trenches are made ſomewhat convex towards the middle, the better to convey the water to drains cut at the extremities of the vineyard.

If neceſſity forces to replant an old vineyard, all remains of the old vines muſt be extirpated. The ground ought then to be dunged with old dung, if it can be had, if not with new, and trenched moſt carefully, picking out every remaining root, which ſhould be collected and burnt. The trenched earth ſhould then be covered with old dung, which does not breed weeds, or with freſh earth brought from among thickets. Columella adviſes particularly, to have a careful overſeer to inſpect the workmen, and to be watchful that they do not make baulks.

Mr. Miller, inſtead of trenching the ground as the ancients did, propoſes giving it a ſummer fallow, plowing it as deep as the ſoil will admit of, and clearing it of roots, weeds, or whatever elſe can obſtruct the growth of the plants.

Columella adviſes great care to be taken in the choice of the vine from which the cuttings are taken, and is therefore againſt purchaſing ſtrange plants at a venture, which may come from a ſoil and climate different from that they are intended for, and may not be of the ſort of vine which is deſired. A vine cannot be ſaid to be fruitful, becauſe it bears many grapes; for this may ariſe from the largeneſs of the trunk, and the great number of bearing ſhoots, which may have but a ſingle bunch on each. If ſeveral bunches of grapes are ſeen to hang from each ſhoot: if from each bud left the former year, ſhoots with fruit ſpring forth; if the ſhoots which ſpring out of the trunk of the vine have ſome bunches; and if even the ſecondary ſhoots, or thoſe which grow out of the preſent year's ſhoots, bear grapes; that vine may undoubtedly be eſteemed fruitful, and fit to afford cuttings. Whoever has this much at heart, will mark the vines which have been the moſt fruitful, and have yielded the ripeſt and ſoundeſt grapes, with ochre and vinegar, that it may not be waſhed off by the rain. Nor is this to be done for one year only; but the vines ought to be examined for three or more vintages, to know whether they preſerve the ſame degree of fruitfulneſs: for then it will be certain, that the fruitfulneſs muſt be owing to the good quality of the vine, and not to a favourable ſeaſon. Whatever grapes come to their full maturity without being rotted or damaged, for ſeveral ſeaſons running, will yield more, and higher flavoured wine, than any others.

It is not enough that the ſtock from which the cuttings are taken be fruitful, but they muſt alſo be taken from thoſe parts of it which promiſe the greateſt fruitfulneſs. Thoſe which grow from the ſtem or old wood of the vine, ſeldom bear fruit, or produce fruitful vines. Thoſe which grow from the ſummit of the vine are reckoned too luxuriant to plant; and though the number of cluſters on them may promiſe fruitfulneſs, yet they ſhould not be relied on; but rather thoſe which grow out of the middle of the vine, of which the wood is firmer than that of the former. This Columella calls the genital part of the vine; and ſays, that, having followed reaſon as his guide, and alſo a long experience, he chooſes from that fruitful part of the vine, ſhoots which, bearing plenty of fruit already, promiſe fecundity for the time to come. He is not contented with ſingle cluſters, but chiefly approves of thoſe which have the moſt numerous offspring; and adds, that the neglect of theſe rules has rendered many vineyards leſs fruitful, indeed ſome quite barren, when the cuttings have been very improperly choſen.

Some are of opinion, that the whole ſhoot, as it is taken from the ſtem, is fit for planting; and for that end, they cut it into pieces of five or ſix eyes, each of which they plant. Others, with more reaſon, think that no part of the ſhoot is fit for being formed into a cutting, but only that part of it which is next to the wood of the former year: for every bearing ſhoot abounds in fruit below the fifth or ſixth eye. The reſt either bears no fruit, or produces only ſlender twigs. The ancients, ſays Columella, always preſerved ſome of the old wood to the cuttings: but experience has ſhewn that this is wrong; for whatever is left of the old wood ſoon roots, when it is moiſtened and covered with earth, and kills the tender roots next to it; and when this happens, the whole vine ſhrivels, or is burnt up. Whatever remains of the old wood ſhould therefore be cut off, where the ſhoot grows to it, that the ſhoot may be planted with its own ſmall head. Mr. Miller differs here in opinion from Columella; for he directs, that the ſhoots ſhould be cut from the old vine, juſt below the place where they were produced, taking a knot, or piece of the two years old wood to each, which, ſays he, ſhould be pruned ſmooth.

Were cuttings, thus choſen, taken from the vines every time they are pruned, for ſeveral vintages, and carefully planted, vineyards might be raiſed, which would yield plenty of the moſt generous wines: nor need we grudge this delay; for when once we are aſſured of the fruitfulneſs of a vine, it may be multiplied by engrafting. This, ſays Columella, you, Publius Silvinus, can witneſs: for, from one early vine on your eſtate, I engrafted the ſtocks of two jugera of vineyard in two years. How much therefore, may the vine be multiplied from theſe two jugera, ſeeing that theſe are the offspring of only one?

There are two ways of planting vineyards; viz. either with cuttings, or with vines which have already taken root. Theſe laſt are called quickſets. In the provinces, ſays Columella, they plant cuttings, for they will not be at the trouble of having nurſeries. The expert huſbandmen in Italy approve of this practice, becauſe the quickſets are attended with ſeveral advantages. They are leſs apt to die; and by reaſon of the greater firmneſs of their wood, they ſuſtain better the extremities of heat and cold, and other intemperatures of the weather: and the tranſplanting of them quickens their producing grapes. Cuttings may do in a looſe yielding mould; but a ſtrong heavy ſoil muſt have rooted vines, or quickſets.

Mr. Miller prefers good cuttings to rooted vines, for planting a vineyard; becauſe the roots of vines do not grow ſtrong and woody, as moſt ſorts of trees do, but are long, ſlender and pliable; and therefore, after they have been taken up, they ſeldom ſtrike out any fibres from the weak roots: but theſe generally ſhrivel and die, and thereby rather retard, than help, the plants in their growth, by preventing the new fibres from puſhing out.

This difference of opinion between Columella and Mr. Miller may be accounted for, from the different depths at which they direct the vines to be planted: for were cuttings to be planted two feet and an half deep, no roots would ſhoot out from their loweſt part; and if the rooted vines were planted ſo ſuperficially in Italy as Mr. Miller adviſes, they would be dried up by the ſun.

Columella directs that the nurſery be made, neither in a poor hungry ſoil, nor in an ouſy wet one; yet where there is moiſture enough; and in a middling rather than a rich ſoil; becauſe, though cuttings take root ſoon, and make ſtrong ſhoots in a rich ſoil; yet, when tranſplanted, they ſhrivel, and ſeldom recover. It is therefore the huſbandman's intereſt, rather to tranſplant from a middling ſoil to a rich one, than from a rich to a poorer. From a rich ſoil to a rich ſoil, they will thrive apace. It is not adviſable to make the nurſery in very poor land, becauſe many of the cuttings will then die, and the others will arrive but ſlowly at a ſtate to bear being tranſplanted.

The nurſery ſhould be trenched to the depth of two feet and an half, and being formed into beds three feet wide, the cuttings are planted in them at about a foot diſtance from one another, every way. This may be done either in the ſpring or in autumn. The ſpring is beſt if the climate be cold, or ſubject to much rain; and the autumn if the climate be warm, and the ſoil dry, or ſituated on the ſide of a hill.

The length of the cuttings ſhould be regulated by the diſtance between their eyes: for when theſe are near one another, the cutting may be ſhorter, and when they are more diſtant, it ſhould be longer. This length ſhould not exceed a foot, nor ſhould it be leſs than three fourths of a foot, leſt, being planted on the ſurface of the earth, the cutting ſhould periſh with drought in the ſummer; and, on the other hand, becauſe when a cutting planted too deep has

has taken root, it cannot be taken up without ſome difficulty. If the cuttings are planted on the ſide of a hill, their length may be about fifteen inches on ouſy ground, they need not have above three eyes, which may reduce them to nine inches, but certainly to more than ſix. In theſe three eyes are not included the numerous eyes which uſually are on the cutting, near the part where it is taken from the ſtem: beſides thoſe numerous eyes, there ſhould be three others, with joints. The cuttings ſhould be planted ſo deep, as that the uppermoſt eye may be level with the ſurface of the ground; becauſe all the ſap will then be employed in one ſingle ſhoot, which will conſequently be ſo much the ſtronger. They ſhould be planted as ſoon as poſſible after they are cut off the vine; and in doing this care ſhould be taken to avoid a ſtrong drying wind, or a ſcorching ſun. It is therefore beſt to chooſe a calm day, or at leaſt a day in which there is but little wind. The ſun may be kept off by ſhades, or any covering. The nurſery ſhould afterwards be kept clear of weeds, and be frequently dug. Only one ſhoot ſhould be reared, and that ſhould be faſtened to a ſtick or ſlender pole, to bear it off the earth. The reſt ſhould be carefully rubbed off; and this ſhoot ſhould be pruned down to two eyes in the autumn. The ſtrongeſt ſhoot from theſe eyes ſhould be reared the next ſummer; and with this management the cuttings will be fit to tranſplant at the end of thirty or thirty-ſix months.

Vines are likewiſe propagated by layers. For this purpoſe, a trench is dug four feet every way, that the layer may not be hurt by other roots. A ſhoot of the laſt year is then laid down in it, in ſuch manner as to make its end riſe at the farther part of the trench. Four eyes are left on that part of the layer which goes to the bottom of the trench, and they are to put out roots. All the eyes between them and the ſtem ſhould be rubbed off, to prevent the growth of uſeleſs ſhoots. Two, or at moſt three, eyes are left on the farther end, which riſes out of the earth, and all the reſt, between them and thoſe at the bottom of the trench, are rubbed off. The layer thus prepared ſoon takes deep root, and in the third year, it may be cut off from the mother vine. When the ſhoot is not long enough to riſe again out of the earth, Columella thought of the following method. The end of the ſhoot is brought to the bottom of the trench, and the four lower eyes, left for the roots to ſhoot from, are covered with earth, as before: but inſtead of the eyes at the extremity, as in the former way, the two eyes next the ſurface of the earth, of that part which come from the ſtem, are left to make ſhoots, which they readily do, and in the third year, the layer may be cut from the mother vine, as in the other caſe. In order to encourage the roots to ſtrike out, they need not be covered with the whole depth of earth the firſt year, unleſs it ſhould become neceſſary before the winter, to keep the roots from being chilled by water which might gather in the trench.

The ground being thoroughly prepared, by trenching, harrowing, and clearing it of every thing that can be hurtful to the vine, it is marked out, in order to be planted. The Romans planted their vines five feet aſunder in a poor ſoil, ſix feet aſunder in a middling ſoil, and at the diſtance of ſeven feet from each other in a rich ſoil. Sometimes too they left a ſpace of ten feet between them, that there might be ſufficient room for the ſtrong ſhoots to extend themſelves.

They generally planted their vineyards in a quincunx form, for which they marked out the ground by ſtretching acroſs it a line trimmed with bits of red cloth, or of ſome other conſpicuous colour, at ſuch diſtances from each other as it was intended to leave between the rows. A piece of reed was ſtuck into the earth at each ſpot indicated by the cloth, and this was repeated till the whole field was marked out in equal diſtances. The planter followed, and dug a hole at each alternate reed, two feet and an half deep in level ground, two feet and three quarters if it lay ſloping, and three feet deep where the declivity was conſiderable. He then removed the quick-ſets from the nurſery, taking them up with great care, and tranſplanted them the very ſame minute, if that was poſſible. All their ſhoots were previouſly pruned off, except one, which was the foundeſt and firmeſt, and of that only two eyes were left above ground. If any of the roots were hurt in taking them up, though all poſſible care was uſed not to injure them, they were cut off, very ſmooth. If two plants were ſet in the ſame hole, a few ſtones, of about five pounds weight, were laid between them in the bottom of the hole, to prevent their roots from interweaving together. They were likewiſe of opinion, that theſe ſtones ſaved the roots from being chilled in the winter, or ſcorched by the heat of the dog-days in the ſummer. Mago adviſed to lay the huſks and ſtones of grapes mixed with dung, in the holes, under the roots of the vines, as a means of ſtrengthening them, and of haſtening the production of young roots. During the chilling wet of the winter, they gave a warmth; and in the ſummer, they afforded a nouriſhing moiſture. Columella diſapproved greatly of putting two vines in the ſame hole, becauſe their roots conſtantly mingled together, and formed a kind of net-work, which retained too much moiſture in the winter, and, by robbing each other of nouriſhment, proved prejudicial to both. If the ſoil of the vineyard was poor, Mago directed that the holes ſhould be filled up with rich earth brought from elſewhere. The ground ſhould be a little moiſt when the vines are planted; but it had better be dry, than mirey wet.

Mr. Miller orders that the ground, which he before directed to be fallowed, be again well plowed in March; and that after having laid its ſurface even, the rows ſhould be marked out, from ſouth-eaſt to north-weſt, at the diſtance of ten feet from each other. He then croſſes theſe rows at the diſtance of five or ſix feet, and thereby marks the ſpot where each plant is to be ſet. The rows will conſequently be, in this caſe, ten feet aſunder, and the diſtance between the vines in each row will be five or ſix feet; nearer than which they ought never to be planted. If they are ſet in ſquares ſo near together as ſix feet, there cannot be room for a ſufficient current of air to paſs between them when their branches are extended on one ſide; and for want of that the damps in autumn will be detained among the vines, to the great prejudice of their fruit. In places abroad, continues he, where they regard the quality of their wine more than the quantity, they never plant their vines at leſs than ten feet, row from row, and ſome allow twelve: and he confirms the juſtneſs of this rule by what happens to other fruits, which are never ſo well coloured, ſo early ripe, or ſo well flavoured, when in cloſe plantations, as when they are produced on trees where the air can circulate freely about them, and the rays of the ſun have free acceſs to the branches, whereby the juices are better prepared.

Preferring cuttings to layers, as well as to rooted vines, he directs, that the cuttings be taken from the vine in the autumn, and that their ends, being made ſmooth, they be laid in the ground, about two inches deep, the reſt of the cutting being left at full length; only obſerving to cover them with dry litter, or peas haulm, in dry froſty weather. In moiſt weather, the covering ſhould be taken off, leſt it heat, and make the cuttings grow, which would greatly injure them. In April, which he reckons the beſt ſeaſon for planting vines in England, the cuttings ſhould be taken out of the ground, and their upper parts cut off, ſo as to reduce them to about fourteen inches in length, according to the diſtance of the buds or eyes. He thinks it of great ſervice to leave their tops on all the winter, becauſe the air would otherwiſe penetrate the wounded part, and greatly injure the remaining eyes. The lower ends of the cuttings ſhould be put in water, about three inches deep, ſetting them upright, for ſix or eight hours, before they are planted, in order to moiſten them and open their pores: then, at the centre of every croſs mark, before made, a hole ſhould be dug with a ſpade, about a foot deep, and one ſtrong cutting ſhould be ſet, a little ſloping, in each of theſe holes, which ſhould afterwards be filled up immediately with earth preſſed down gently to the cutting. This earth ſhould be raiſed about three inches round each cutting, ſo as juſt to cover its upper eye or bud, to prevent the wind and ſun from drying it; for only that upper bud will ſhoot when the plant is thus managed.

Mr. Miller juſtly blames his countrymen for planting their vineyards, in the few attempts that have been made of them in England, with ſuch grapes as are the ſweeteſt and beſt for eating; this being contrary to the general practice abroad, where the rough auſtere grapes, which are by no means palatable, but which are by experience

 found

found to afford a noble rich wine, are preferred. This is alſo agreeable to the conſtant practice of the makers of cyder, who obſerve, that the beſt eating apples yield but a poor juice, and that the rough ſorts afford a ſtrong vinous liquor. I believe, continues he, that it will be found true in all fruits, that where the natural heat of the ſun ripens and prepares their juices, ſo as to render them palatable; whatever degree of heat theſe juices have more, either by fermentation, or from any other cauſe, will render them weaker, and leſs ſpirituous. Of this we have many inſtances in fruits: for if we tranſplant any of our ſummer or autumn fruits, which ripen perfectly in England without the aſſiſtance of art, into a climate a few degrees warmer, theſe fruits will be mealy and inſipid. So likewiſe, if we bake or ſtew any of theſe fruits, they will be good for little, becauſe they will loſe all their ſpirit and flavour by the additional heat of the fire: and on the other hand, many fruits which are not even eatable whilſt raw, are thereby much improved. Some of theſe, which have been tranſplanted into a warmer climate, have been ſo altered by the greater heat of the ſun, as to excel the very fineſt of the fruits that are ripened in this country. The grape moſt likely to ſucceed in England, is the Auvernat, or true Burgundy grape, which thrives very well in ſeveral places north of Paris.

Columella adviſes every prudent huſbandman to ſtock his vineyards with different ſorts of vines, becauſe the weather is not ſo equal in any year, but that it may be more hurtful to ſome, than to others. If, therefore, he plants but one kind of vine, and the weather happens to be prejudicial to it, he will be deprived of his whole vintage: but if he has vineyards of various ſorts, ſome of them may eſcape, and yield him fruit. He recommends particularly, that each kind of vine be planted by itſelf; becauſe otherwiſe one of the following inconveniencies will enſue; viz. either he muſt gather his late grapes with thoſe that are early ripe, which will cauſe an acidity in the wine; or if he waits till the late fruit come to maturity, the early grapes will be rotten, or deſtroyed by birds or rain: for the diſtinguiſhing of each kind cannot be truſted to the gatherer's diſcretion. The flavour of the ripe grapes is hurt by the addition of the unripe; nor will the wine made of them both, mixed together, keep till it is old. When each ſort is ſeparate, the vine dreſſer will be able to prune and manage it in the moſt proper manner.

He cautions his readers ſtrongly againſt the too prevailing opinion of thoſe who imagine, that the chief care and trouble are at an end when the vineyard is planted. He obſerves, that the vine is a tender delicate ſhrub, which can very ill bear neglect, and which, when young, often deſtroys itſelf, by being permitted to run too much to wood, or to bear too great quantities of fruit. Moſt people are ſo intent on having much fruit, that they load the vine with too many bearing branches, without having any regard to future years, or to poſterity; and then complain, that their vineyards do not anſwer their expectation, when they themſelves have deſtroyed them, either through covetouſneſs, negligence, or ignorance. When the vine has arrived at its full ſtrength and maturity, it can better bear ſome neglect. Believe Silvinus, ſays this excellent huſbandman to his friend, what I know from my own experience, that a vineyard judiciouſly planted with good vines, and well cultivated, never fails to bring its owner a moſt abundant return. This he confirms from Græcinus, by the example of Pavidius Veterenſis, who had two daughters, and a farm planted with vines. He gave the eldeſt daughter one third of his farm, on her marriage, and yet had as much fruit from the remaining two thirds, as he had before from the whole. He afterwards gave half of the remainder to the younger daughter, on her marriage, and ſtill had as good an income as at firſt. This, ſays Columella, muſt ariſe from the remaining thirds being proportionally better cultivated, than the whole had been before.

When the vineyard was perfectly well cultivated, and in a good ſoil, the Romans planted cuttings in the ſpaces between the vines, where they grew as in a nurſery. The vines and cuttings ſoon throve and gathered ſtrength, when the ground was kept in ſo looſe a ſtate by frequent digging, as to be reduced to powder, and always perfectly free from weeds, which would conſume the nouriſhing moiſture that ſhould feed the plants, whoſe roots extended eaſily in ſuch looſe mould. It was a general rule, that the diggings ſhould be repeated once a month, from the firſt of March to the firſt of October; and all weeds were carefully pulled up by hand, and carried off the ground, leſt they ſhould take root again. Mr. Miller ſays, that as the ſpace between the rows of vines is great, the ground there may be ſown or planted with any kind of eſculent plants, provided they are kept at ſuch diſtance from the vines, that theſe be not injured by them. This huſbandry, which is alſo the method in France, may be continued three or four years, till the vines come to bearing: but after that, no ſort of crop ſhould be ſet between them in the ſummer; becauſe, the clearer the ground is kept, the more heat will be reflected to the grapes. After they are gathered, a crop of coleworts, for ſpring uſe, may indeed be planted between the rows, and the ſtirring of the ground for them will be of great ſervice to the vines.

From the time that the vine firſt begins to bud, all ſuperfluous ſhoots muſt be carefully rubbed off, that the nouriſhment may be conſumed by thoſe only which are to be reared. Two ſhoots are generally ſet apart for growth; the one as a reſerve, in caſe the other ſhould fail. As ſoon as they riſe, a prop ſhould be ſet in the ground, for each of them. This prop ſhould be ſlender, becauſe the weak tendrils of the vine will then lay hold of it more eaſily than if it was thick. As the ſhoots grow up, they are tied to the props with a ſoft ſlack binding, till their tendrils have encircled them; and at leſs than four feet from the ground, ſticks are faſtened acroſs the props, that the vines may extend laterally, and thereby be the leſs expoſed to the force of winds. In nurſeries, this croſs ſtick, or rail, ſhould not be above a foot high, leſt ſtrong winds ſhould tear the young plants out of the earth. When the ſhoots are grown nearly to their full height, their tops are broken off, to make them increaſe in thickneſs and ſtrength, rather than run up into a needleſs length. The moſt thriving ſhoot, which is to be the leading wood branch, muſt be trained up ſtrait, and kept clear of ſecondary ſhoots for three feet and a half from the ground: but ſuch as grow above that height may be permitted to remain till the autumnal pruning; for if they are all rubbed off, new ſhoots will immediately ſpring out from other eyes, ſo that, perhaps, none may be left for the next year's buds. The ſhoots which are rubbed off from time to time ſhould never be ſuffered to grow ſo ſtrong, as not to be eaſily diſplaced with the finger; for the heat in ſummer hurts the vine greatly wherever it has been wounded with a knife. For this reaſon, if it ſhould be abſolutely neceſſary to uſe the knife, a piece of the ſhoot which is cut off ſhould be left prominent from the ſtem, to ſtop the effect of the heat, which, in that caſe, will not proceed farther.

About the middle of October, or before the cold came on, the Romans *ablaqueated*, as they called it, the roots of their vines; that is, they laid them bare, ſo as to expoſe to view the upper ſmall roots which the vine had put forth in the ſummer, and which ſhould be cut off with a knife; for if theſe are ſuffered to grow large, the lower ones will decay, and the vine will then be nouriſhed only by roots, which, extending themſelves along the ſurface of the earth, or but little deeper, muſt be expoſed to the inclemency of the winter's froſt, and be liable to be parched by the drought and heat of the ſummer. Whatever roots appear within a foot and an half of the ſurface muſt therefore be cut off. The beſt way is to cut them about an inch from the ſtem, and to leave that ſtump prominent; for if they are cut cloſe, either others will ſhoot out, or the water which ſtands in the hollow made round the root, being frozen, will deſtroy the ſtem to the very pith, where the ſcar is: but both theſe accidents are prevented, by cutting them off at a little diſtance from the ſtem. And now will appear a reaſon why the vines ſhould ſtand upright in the ground: it is, that if they are inclined, they muſt be liable to be wounded when they are ablaqueated; for while the digger is intent on digging, and forming a hollow round the vine, he may inadvertently wound the vines which grow obliquely, or even cut them quite through. If the winter is mild, the roots may remain uncovered till March; but if the ſeverity of the weather forbids this, the hollows ſhould be filled up by the beginning of December. Where the winters are very ſevere, ſome dung,

or,

or, if it can be eafily come at, pigeon's dung, or urine which has been kept a long while, fhould be laid to the roots before they are covered. The vines fhould be thus ablaqueated every winter, for the firft five years; and after that, as the lower roots will then have got pretty fufficient ftrength, it need not be repeated above once in three years.

From thefe directions of Columella, we may affign a reafon why Mr. Miller does not fpeak of ablaqueating the vine. Columella wrote for Italy, where the heat of the fun is very powerful, and dries the furface of the earth to a confiderable depth. It was therefore neceffary, in order to fecure moifture for the roots, to plant and keep them deep in the earth: but as the degree of heat in England is much milder, as well as of fhorter duration, and as the earth here is refrefhed by much more frequent fhowers during the fummer, Mr. Miller directs the vines to be planted much fhallower, and finds that it is not neceffary to ablaqueate them. He rather guards againft their taking too deep root.

The Romans reared all their vines in one ftem to fome height above the ground; and therefore, as foon as they had finifhed ablaqueating them, they cut off the weakeft of the two fhoots, which they called the fhoot of referve, and pruned the remaining fhoot to two eyes. Mr. Miller directs that both the fhoots be cut down to two eyes, and that the earth be drawn up in a hill about each plant, which will be a great defence againft froft. The wound fhould be made obliquely, almoft in the middle between the joints, left water fhould lodge in the pith, if the fhoot were cut horizontally: but the flope muft not be toward the eye, left this fhould be hurt by the trickling down of the fap, or tears, which will ooze from the wound. Mago recommends the fpring, as the fitteft time for pruning the vine; becaufe, being then full of fap, it affords an eafy paffage to the knife: but Columella does not approve of this, unlefs it be in countries where the winters are very fevere: otherwife, he thinks the autumn the beft feafon. The early writers on hufbandry forbid touching the vine with the knife during the firft year; and Columella, who likewife difapproves of it, making experience his guide, neither fuffered his vines to become wild, by running too much to wood; nor did he, by cutting off the young fhoots entirely, force them to fhoot from the ftem, which feldom proves fo fruitful as fhoots from the young wood.

During the fecond year's growth, the ground fhould be kept conftantly ftirred, as in the preceding year, only with this difference, that it may be done once feldomer. The weeds muft be kept under, till the vines, by extending their branches, fhade the ground, and thereby prevent their growing under them. All fuperfluous twigs muft be conftantly rubbed off as before, and only one fhoot fhould be permitted to grow up. The props muft be continued as in the former year. If any of the plants died in the firft year, two fhoots may be reared up on the ftrongeft of the vines next the vacant fpace; one to form the ftandard fhoot, and the other to be made a layer, to fupply the place of the dead vine. After the vintage, this fhoot muft be laid down, or if it be not long enough to rife out of the earth on the other fide of the hole, only its extremity need be put into the ground, as already directed. Next year, the layer muft be cut half through, in the bend, that fo it may not rob its mother too much, but be brought to be nourifhed by its own roots. When it is two years old, it may be cut off from the mother plant, and its root muft be carefully ablaqueated, that it may ftrike the deeper into the earth. If the neighbouring vines cannot furnifh layers, a rooted vine muft be brought from the nurfery; for it is too late to recruit a vineyard, when we fhould be gathering its fruit.

For the third year's growth, the vine muft be fupported with ftronger and higher props than before. Thefe fhould be fixed, either a foot from the vine, that they may not hurt the roots, and that fo the vine-dreffer may dig all round the vine; or in the middle between two vines. The firft way is the beft, becaufe the vine and prop mutually fupport each other. If the prop is fixed near the vine, it fhould ftand fo as to fhelter the vine from the north. It is of great importance that the prop ftand very firm. On each upright prop muft be put a crofs pole, fufficiently ftrong to bear the weight of the fruit. This year the vine may be permitted to make two fhoots, to cover the crofs pole on each fide with bearing branches, unlefs the vine be yet too weak to nourifh them. All fuperfluous fhoots and twigs muft be carefully rubbed off. The ground muft be frequently ftirred, to keep it loofe, and deftroy weeds. The roots muft be laid bare in October. The places of dead plants muft be fupplied, as directed for the preceding year, and this muft be a conftant rule every year. When a vine dies after it has ftood for fome years, the hole or trench which is made for the layer or young plant, muft be dug deeper and wider than it need to be after a young vine, in order that all the roots of the old one may be taken away. The trench fhould then be partly filled with frefh earth, or a good deal of dung mixed with the former foil. If each fide of the vine has produced two fhoots, and both of them fhew plenty of fruit; yet one muft be taken away, that the other may thrive the better, and bring its fruit to greater perfection.

When this vintage is finifhed, the vine may be pruned fo as, in a fertile foil, where it thrives well, to leave three eyes, to produce bearing fhoots for the next year; but four eyes fhould feldom be left. The binder muft feparate thefe fhoots, and tie them to the frame, to which another crofs pole is now added, in the form of a ftar: or thefe crofs poles may be fupported by four props. The fhoots fpread in this manner become a counterpoife to each other. Thefe crofs frames are the more neceffary if the vines are expofed to ftormy winds, or if they ftand on fteep declivities, where every means of propping them is wanted. In warm and dry fituations, the frame may be extended on all fides, in the form of an arched roof, the better to fhade the thirfty earth: but in cold and frofty climates, the vines muft be fupported only on fingle frames or efpaliers; for then the earth is more eafily warmed by the fun, the fruit is more thoroughly ripened, and a freer paffage is afforded to the air. The frames fhould not be lower than four feet, nor higher than feven. Young vines fhould be brought to this height gradually. The moifter the foil and climate are, the higher fhould be the frame; for there, the thriving ftate of the vines admits of raifing their branches, and their fruit being thereby raifed higher from the earth, is the lefs liable to rot. In this fituation, the winds blow freely through them, and dry up the dews and noxious fogs; the vines bloffom more kindly, and yield a better wine. On the other hand, vines in a poor foil, on a fteep declivity, and fubject to fcorching heat, require lower frames. If the vineyard is well placed, the beft height is five feet; though there is no doubt but that the wine is the better flavoured, the higher the frames are.

If the vineyard is interfected by foot paths which divide it into a number of fmall partitions, the fun and wind have the freer accefs to the vines; as hath alfo the eye of the mafter, which is of great advantage. The labour too feems lefs to the vine dreffers, when it is thus portioned out in fmall divifions. The paths afford convenient paffage for the grape gatherers, for thofe who repair the frames, and for bringing in manures, or what elfe may be wanted. The owner can likewife diftinguifh the fruitfulnefs of each fpot, and thereby be enabled to apply proper remedies. Where the rows of vines ftand very far afunder, too much ground is generally left uncultivated between them; one half of which is commonly ufed for alleys, or foot-paths.

The trunk of the vine fhould be carried up ftrait to within a foot of the top of the frame; not only to conduce to its beauty, but alfo to its fruitfulnefs and duration: for the moifture which nourifhes plants never has fo free a motion through a crooked ftem, as it has through a ftrait one; the bendings proving fo many lets or hinderances to the equal circulation of the fap. The top of the vine fhould be faftened to the prop, fo as to prevent its being bent, or dragged down, when it is loaded with fruit; and for greater fecurity in this refpect, the arms, or branches, which proceed from thence, fhould be trained along the frame, and tied to it, fo that only thofe parts of the fhoots on which the fruit grows may hang floping down from the edge of the frame: nor fhould this be at right angles from the binding, becaufe that pofition would endanger their breaking. When thus fituated, they are lefs expofed to rain and hail, than when they are faftened to the frame. They fhould however be tied up before the grapes are ripe, to guard againſt their being rotted by the dew. When the vine is five years old, it will be ſufficient to leave one fruit bearing ſhoot on each of its arms, or branches: but, ſome years after, when it has attained its full ſtrength, a luxuriant vine, in a rich ſoil, may convey nouriſhment to eight fruit-bearing ſhoots; and, indeed, unleſs it be checked by a quantity of fruit, it will waſte itſelf in wood and leaves: whereas a weak vine, in a poor ſoil, will ſoon be exhauſted if it is burthened with fruit.

The branches of a vine ſhould never be ſuffered to grow bigger than the ſtock: but, to ſupply their place, ſhoots iſſuing from their ſides ſhould be trained, and as ſoon as theſe begin to bear fruit, the old hard wood ſhould be cut away. Fewer bearing ſhoots ſhould be left on the branch which extends northward, than on that which is directed toward the ſouth; becauſe this laſt requires the greateſt ſhelter from the ſcorching heat of the ſun, and therefore ſtands moſt in need of leaves. All ſuckers muſt be cut away from the root, and the place whence they ſprung ſmoothed with a knife; for then it will ſoon ſkin over. No ſhoots muſt be ſuffered to grow from the trunk, nor ſhould any knobs or warts be left on it. All dry, cracked, and ſhrivelled bark, muſt be taken off. Moſs likewiſe, which ſhackles the vine, as with a fetter, and ſoaks it with its pernicious moiſture, muſt be carefully ſcraped off; and if the trunk is any way damaged, or rendered hollow by rain or inſects, it muſt be cut away to the ſound wood. The wound ſhould then be covered with earth which has been moiſtened with lees of oil; for this will defend it from inſects, ſun, and rain, and therefore make it heal the ſooner. All broad, ill-ſhaped, withered ſprays, and ſuch as hang downward, commonly called danglers, muſt be cut off; and the ſtrait ſhoots muſt be preſerved. When the vine is freed from all theſe incumbrances, it will thrive the better, and yield the purer wine. The vine dreſſer ſhould be particularly attentive, that all wounds in the ſolid wood be made ſloping and round; becauſe they afford the leaſt lodgment to water, and are the ſooneſt cloſed.

Sometimes a ſtrong ſhoot ſtrikes out of the fork of two of the leading branches, and cripples one of them. In this caſe, the crippled branch muſt be cut off, and the young ſhoot reared in its ſtead: but if it be taken in time, the young ſhoot ſhould be cut off. Whatever grows out of the trunk of the vine muſt be cut away ſo ſmooth, that no water may lodge in the ſcar: but what grows on the young ſhoots of the ſame year, ſhould be cut off between the two firſt eyes; leſt by cutting it too near the main ſhoot, this alſo ſhould be hurt by the wound, and the neighbouring bud be killed.

As to the length of the fruit-bearing ſhoots, there is no general rule; for it may depend greatly on the quality of the ſoil, and the vigour of the vines, as well as on the diſtance between the eyes; for where the joints are ſhorter, a leſs length of ſhoot may be equally loaded with fruit. The laſt year's vintage ſhould alſo be conſidered: for thoſe parts of the vine which then bore great plenty of fruit, muſt be ſpared in the following year; and ſuch as produced but a ſmall quantity, may be loaded the more. Moſt particulare care ſhould be taken, that every cutting inſtrument which touches a vine, be ſharp and well tempered; for otherwiſe, the labour of the vine dreſſer is greater, and the vine is rather torn than cut; ſo that there then remains an uneven ſcar, in which the juices putrify, ſo as often to kill the vine.

Mr. Miller agrees with Columella in keeping the vine clear of uſeleſs ſhoots, and in the frequent ſtirring of the ground: only, as the vines in England are not planted ſo deep as in Italy, he cautions againſt digging too deep cloſe to the vines, leſt their roots be cut or bruiſed. He differs ſomewhat in the method of propping and pruning, which he directs to be done as follows.

At the beginning of May, in their ſecond year, when the vines are ſhooting, two ſtakes, ſomewhat taller and ſtronger than thoſe of the preceding year, ſhould be fixed down to the ſide of each plant, and the two ſhoots ſhould be faſtened to them.

In the autumn, the vines which have produced two ſtrong ſhoots of equal vigour, muſt be cut down to three eyes each. When they have a ſtrong ſhoot and a weak one, the ſtrong ſhoot muſt be ſhortened to three eyes, and the weak one to two: and ſuch as have but one ſtrong ſhoot, ſhould be ſhortened to two eyes.

In March of the third year, two ſtakes ſhould be placed down by the ſide of all ſuch vines as have two ſhoots, at ſuch diſtance on each ſide of the plant, that the ſhoots, faſtened thereto, may form an angle of forty-five degrees with the ſtem: but they ſhould not by any means be bent down horizontally, as ſome injudiciouſly adviſe and practice: for the branches, then lying too near the earth, are generally injured by the damps which ariſe from thence, eſpecially if they have fruit, which is never ſo well taſted, nor ſo ripe, as when they are a little elevated. In May, the ſtrong ſhoots ſhould be faſtened to the ſtakes.

If the two ſhoots of the former year have produced two ſtrong branches, the uppermoſt of theſe ſhoots upon each branch ſhould be ſhortened down to three good eyes, not including the lower eye, which ſeldom produces any thing more than a weak dangling ſhoot; and the lower ſhoot ſhould be ſhortened to two good eyes; theſe being deſigned to yield vigorous ſhoots for the next year, as the former are to bear fruit. Where the vines are weak, and have not produced more than two or three ſhoots in the ſummer, but one of theſe ſhould be left with three eyes, for bearing; the other muſt be ſhortened down to two, or if it be weak, to one good eye, in order to obtain ſtrong ſhoots the following ſummer: for nothing is more injurious to young vines, than leaving too much wood upon them, or over bearing them.

In March of the fourth year, all ſmall horizontal roots, which may have been produced near the ſurface of the ground, ſhould be cut off cloſe to the trunk. A ſtake ſhould be placed about ſixteen inches from the root, on each ſide of the vine, and the bearing branches ſhould be faſtened thereto. Then another, and taller, ſtake ſhould be thruſt down near the foot of the vine, and to this ſhould be tied the two ſhoots which were pruned down to two eyes. In May, the ſhoots which ſhew fruit muſt be faſtened to the ſtakes, with baſs, to prevent their being broken, until they are extended to three joints beyond the fruit; when they ſhould be ſtopped, by nipping off the end: but the ſhoots, which are deſigned for bearing the next year, ſhould be trained upright to the middle ſtake; by which method, neither of them ſhading the other, each will enjoy the benefit of the ſun and air. The ſhoots ſhould be conſtantly kept in their right poſition, to prevent the inverting of their leaves; for when that happens, it greatly retards the growth of the fruit.

Mr. Miller very juſtly cenſures the abſurd practice of thoſe who pull off from their vines the leaves which grow near the fruit, in order to let in the rays of the ſun, to ripen it; not conſidering how much they thereby expoſe their fruit to the cold dews which fall plentifully in autumn, and which, being imbibed by the fruit, greatly retard it: beſides, no fruit will ripen ſo well when it is entirely expoſed to the ſun, as when it is moderately ſcreened with leaves. By pulling off the leaves, which are abſolutely neceſſary to prepare the juices before they enter the fruit, and of which juices the groſs parts are perſpired by them; the fruit muſt either be deprived of nouriſhment, or elſe, ſome of the groſs particles will enter with the more refined parts of the juices, and thereby render the fruit worſe than it would be if the leaves were left upon the branches.

This naturally leads me to another opinion, which I have long been inclined to entertain: it is, that not only the ſtripping the vine of its leaves, but alſo the ſummer pruning, which is intended to haſten the ripening, and increaſe the goodneſs of the grapes, has the contrary effect. For in the ſpring, and while plants are in a growing ſtate, their juices are of a watery acid nature, abounding in what the chemiſts call their native ſalt. As the ſummer advances, or as, reſpectively in each, their ſeed, or fruit, begins to ripen, their juices loſe that watery acid ſtate, and become gradually milder: and when the ſeed, or fruit, is come to full maturity, the juices of perennial plants become of an oily mucilaginous quality. This change in the nature of the juices of plants is gradual, and perfect, in proportion to the flouriſhing ſtate of the plant. Now, if a conſiderable length is cut off from the young ſhoots of the vine, while it is yet in its luxuriant growing ſtate, and the motion of the ſap is ſtill briſk in it; a check muſt be given to nature in her juices. This is confirmed by the effects of numbers of facts and experiments. As young shoots spring out again after this summer pruning, the juices are probably again brought to a thin watery state, in order to carry on that newly excited vegetation; the change of the juices into their milder and thicker state is thereby retarded, and consequently the richness and mellow ripeness of the fruit is impeded. It would therefore seem more advisable to defer shortening the shoots, till they have nearly arrived at their full length, and the grapes are beginning to ripen. The perfecting of the fruit requires so strong an exertion of all the powers of nature, that few, if any, shoots will then spring out; by which means the buds for the next year will be preserved strong, and the grapes will arrive at a more perfect maturity.

Mr. Miller directs, that the vineyard, being now arrived at a bearing state, should be treated after the following manner. Too many branches should never be left upon a root, nor should those be too long: for although a management contrary to this may be productive of greater quantity of fruit, yet that fruit will not be so well nourished, nor will its juice be so good, as when it is but moderately plentiful: neither will the roots of the plants be so much weakened in this last case, as they must be in the former. The ground should be constantly kept clear of weeds; and no sort of plant should be suffered to grow on it, excepting that which it is intended to cultivate. It should be manured every third year, according to the nature of the soil. If the land is stiff, and inclinable to bind on the surface, sea-sand, or sea-coal ashes, are very good manure: but if it is loose and dry, a little lime mixed with dung will do it the most service. After each spring digging, the stakes are fixed as already mentioned, and the same care and management of the vines, as was before directed, must be continued. Mr. Arnoux says, that, in Burgundy, they bind the branches of the vine in an horizontal position, at the height of half a foot from the earth, to props three or four feet high, stuck into the ground, without any order, at the distance of about a foot asunder. They tie the shoots to these props as they extend in length, and find in this method the advantage that one branch is not shaded by another, but for as little a time as is possible.

Columella directs, that the props and frames be carefully examined after every pruning, and that whatever is amiss in them be repaired. Broad and flat props are preferable to round ones, and oak is the best wood they can be made of. Next to them, are round props of juniper, laurel, forest pine, and elder. Such as are rotten must be taken away, and new ones put in their stead. The bindings should be new every year. The ligature which fastens the stem to the prop should not be always in the same place, lest it should occasion a wound. The four branches should be tied gently to the cross poles, so as not to twist or bend them much. The shoots should be fastened so as that, when they grow beyond the frame, they may go shelving from it, and not hang by their binding, which would be apt to break them, especially when loaded with fruit. When two branches are so near together as to go to the same side of the frame, another pole should be placed between the cross ones, for one of those branches to be fastened to.

Those who are curious in gardening know what great things Dr. Agricola boasts of from the use of his mummies, in rearing the tenderest plants, as well as in raising forest trees from cuttings. The lees of oil, as Columella directs, mixed with fine earth, to give it a consistence, may probably answer the same purposes. Where lees of oil cannot be had, some other bitter vegetable substance might be contrived, which, being free from the acrid oil in all turpentines (as in Agricola's mummies) might prove very friendly to plants, and be particularly useful in preventing their wounds from bleeding, and in preserving them from being scorched by the sun, or hurt by insects. It is necessary that this substance be bitter, that it may hinder the insects from preying on the tender juicy fibres, for instance, of the vine, wherever a wound is made. Even loam, by itself, is found to be serviceable for these purposes; and so is either goat's, sheep, or cow's dung, well mixed with a due proportion of earth. The vine-dresser should therefore constantly have some such substance ready to apply to every wound he makes in the vine. Perhaps too, it may prove useful to the cuttings, when these are planted, by retaining the juices, till they are employed in their office of vegetation, and thereby help to save them from being parched up by drought, as well as to render them less liable to be soaked in a wet soil, or by a rainy season.

Columella gives very particular directions for raising groves, in which trees grow till they are strong enough to become props for vines; as also for making nurseries of trees proper for supporting vines, or being married to them, as the ancients termed it. The plenty of wood in this kingdom, and the still greater abundance of it in America, renders that task unnecessary in this work.

He recommends the poplar as the most friendly tree to the vine, next the elm, and then the ash. As the poplar has fewer leaves, and these are not relished by cattle (which is an object of great importance in Italy, where grass is scarce) many reject it. The ash, whose leaves are agreeable to sheep and goats, is chiefly planted in rugged and mountainous places, where the elm does not thrive well. The elm is the most frequently planted, because it agrees exceedingly with the vine, and cattle are very fond of its cuttings.

When the trees are to be planted out, pits should be dug for them some weeks before they are removed. These pits should be made in a direction which may not interfere with the vine: as east and west, where it is necessary to plant the vine on the south-side of the tree, because of the cold; or south and north, where the vine is to be set on the east or west-side of the tree. If the trees are planted in a field, where corn is to grow, and in a rich soil, the distance between them should be about forty feet: but in a poor soil, where nothing else is planted, twenty feet will be sufficient.

Whatever tree is planted for the purpose of supporting the vine, it should not be pruned for the first two years. If it be an elm, and grows but slowly, all its branches should be cut off excepting one, which should be the fairest and straitest that can be singled out. If it does not grow so upright as one would wish, some inches of the stump of another branch may be left near it, and by tying it thereto it may be trained up strait, in order to form the trunk of the tree. In the next year, the stump must be cut off and smoothed. If there is no branch fit for this purpose, the whole top must be cut off, at the height of nine feet, that cattle may not reach the young shoots. It should be cut with one stroke, if possible; otherwise it should be sawed off, afterwards smoothed, and then covered with loam mixed with straw, to preserve the wound from the sun and rain. In two or three years, when a new head is grown, the useless branches should be cut off, and the rest formed into the following order. In a strong soil, an elm should not have a branch within eight feet of the ground; nor within seven in a poor soil. At these heights, three branches should be left as equally distant as can be, in the circumference of the tree, to form what is called the first story. At three feet above them, three other branches are left, but not in the same line as the lower ones, if there be a possibility of avoiding it, because these would rub against the tender buds of the shoots of the vine hanging from the higher branches, and shake off the grapes. The tree is to be formed into stories, in this manner, up to the top. The branches are suffered to extend more or less wide, as the soil is rich or poor, in order that the shoots of the vine may be spread accordingly. Care should be taken in lopping the elm, that the body of the tree be as little hurt as possible, and that the bark be not torn off, for this would do it great prejudice. The earth should be kept loose around the trees; and all suckers, or whatever else might shade the vine, should be cut away. When the tree grows old, and, either by a wound or otherwise, water lodges in it, a hole should be bored, or a channel cut, to give an outlet to the wet.

The vines should be planted before the trees are very strong. A young elm may bear a young vine, but it would be killed by an old one; wherefore their ages and strength should be proportioned. A trench must be dug for the vine, two feet and a half wide, three feet deep, five or six feet in length, and at least a foot and an half distant from the tree; for if it be planted nearer, the roots of the tree will not permit those of the vine to strike deep enough, and as the tree grows, it will oppress the vine. For a vine that is

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to be planted in the spring, the trench should be dug in the preceding autumn; that the earth may be mellowed by the winter's rain and frost: and if it is to be set in the autumn, the holes should be laid open some weeks before, that the soil may have the benefit of the sun and rain. Though Columella had before found fault with putting two plants in the same hole; he here advises to put two in each trench, a foot asunder, that they may the sooner clothe the tree. A northerly wind, and cold dews, should be avoided at the time of setting them. If the climate is temperate, instead of having two plants in the same trench, a trench may be made on the east and another on the west-side of the tree, and a vine may be planted in each; by which means their roots will have sufficient room to extend in. Though Mr. Miller, as I observed before, thinks it of little consequence whether a tree that is transplanted be set to the same aspect as it had in the nursery; Columella recommends, as a circumstance which is attended with great advantage, particularly to vines (but he extends it to all trees which are removed from the place of their first growth) to mark them before they are taken up, in order that the same side may still be turned to the sun. In dry and warm situations, where neither a severe winter, nor a very wet one, need be feared, the autumn is the best season for planting both vines and trees; laying under their roots the depth of half a foot of the richest and finest mould, and covering them with well dunged earth. The vine should be planted in the trench with its stem inclining to the tree, against which it is to rise up strait; and it must also be defended from cattle. In hot countries, the vine should be planted on the north-side of the tree; in cold ones, on the south; and in temperate climates, either on the east or the west, that it may not be all the day in either the sun or the shade.

In the next autumn, the vines are pruned, as already directed, for frames. When they have reached the first story, shoots should be distributed to each branch, leaving a leading shoot, which is to go up to the top of the tree: and thus each story is gradually covered. It is a rule with many, to load chiefly the lower part of the tree, because there the vine bears most grapes, and they are most easily gathered: but those who regard the quality more than the quantity of their wine, clothe the upper branches most, and garnish the rest with bearing shoots in proportion to their strength. The future pruning consists in cutting off the shoots which bore fruit for the last vintage, and in rearing others in their place. If the vine is very thriving, the bearing shoots may be permitted to hang down sloping from the branch, to which their extremities should then be brought back, and tied: or if the vine is very luxuriant, they may be carried to the next tree. Though these shoots yield a great deal of fruit, they must be cut off at the next pruning, because, otherwise, they would weaken the vine too much. No shoots should be suffered to grow out of the firm wood, unless they are wanted in order to marry them to a widowed branch.

The young vine is tied to the tree at about four feet from the ground, and with this binding its growth may be checked, if it be too luxuriant, or if the tree has been deprived of its branches. It should be tied again at about half way up, and a third time at the top. The vines should be loosened every year, because they are then most easily pruned and cleared of all imperfections; and they are refreshed by being bound in new places. They are also then in less danger of being galled by the binding. The bearing shoots should be so laid on each branch, as that, being tied above the third eye, they may hang slanting down: but they must not be tied tight, lest the binding should cut them. At the same time that some shoots are thus laid for bearing fruit, others should be trained up to the body of the tree, to produce wood for the next year.

If the vine does not clothe the tree sufficiently, a shoot may be turned down to the ground at the autumn pruning, and made a layer, from which as many young plants may be raised, as, being led up to the tree, will cover it enough. When the trees decay, young ones should be immediately planted in their stead; and when the vines begin to be worn out, they should be renewed by layers from neighbouring vines, rather than by quicksets.

To the foregoing directions for the cultivation of tall vines in Italy, and the same are equally applicable to all other warm countries, Columella adds the following account (which we shall likewise abridge from him) of the manner in which vineyards of lower growth were managed in the provinces of the Roman empire.

The husbandman there never trenched all the ground, but only opened a deep furrow, in which the vines were set. This might be sufficient where the soil was naturally loose. In some of these vineyards, the plants stood without any props; in others, they were fastened to rails; sometimes they were tied to dwarf trees; and sometimes they were suffered to run upon the ground. In the first of these cases, a single stem was reared up, free from side-shoots, till it had acquired strength enough to support the fruit bearing branches, which, when they were of a sufficient length, were bent down in a circular form, and tied to the lower part of the stem. In the second case, the fruit bearing shoots were trained to rails, or espaliers, as they grew. In both these ways, the planting, pruning, and other culture, differed so little from the general directions already given, that it would be needless to particularise them here; especially as I shall soon have occasion to speak pretty fully of the management of low and of middle sized vines, as now practised by the French, whose best vineyards consist of none else. As to letting them trail upon the ground, Columella justly thinks it so bad a method, that no excuse can possibly be offered for it, unless the country be indeed uncommonly subject to very high winds: — and then, perhaps, a doubt may arise, whether such a place be at all proper for the vine.

In Gaul, the trees for supporting the vines, besides being kept very low, were, of choice, such as had the fewest leaves. The poplar was therefore much esteemed for this purpose; for which the hornbeam, the mountain ash, and sometimes the willow, were also reared. The willow was planted only in moist places, where other trees could not thrive well; because it was thought to hurt the taste of the wine. The elm was likewise so managed, whilst young, as to be turned to a dwarf; as it may easily be. In dry and hilly situations, the stories of these trees were about eight feet high; and in vallies, or moist places, about twelve feet. These trees were generally divided into three branches, out of which several lesser boughs arose; and all the small twigs were usually cut off, at the time when the vine was pruned, to prevent their shading the fruit too much. If the dwarf trees were planted where corn grew, they were set twenty feet asunder in rows forty feet distant from each other: but when they were planted where there was no corn, their usual distance was twenty feet every way. Here the young shoots of the vines were more frequently carried from one tree to another, than when the trees grew high. If the trees were too far asunder to afford a support to the shoots, poles were extended between them, and these were up-held by props, as soon as the weight of the grapes began to be too heavy for them. In all other respects, the culture of the vine was the same as in Italy.

In clearing the vines of their superfluous shoots and leaves, Columella observes that, in the provinces, in places which were shaded, or where the sun had not much force, or which were moist and cold, the vine dressers used to strip the vines of many of their leaves, that the fruit might be the better ripened by the warmth of the sun, and not be rotted by too much moisture: but in places that were dry, warm, and exposed to the heat of the sun, the grapes were left covered with their leaves and twigs; and if the vine had but few shoots and leaves, the fruit was sheltered by some other covering: "Thus," says he (in the passage before quoted), "my uncle, Marcus Columella, a man skilled in all the liberal arts, and the most diligent farmer in Bœtica, covered his vines with mats in the beginning of the dog days; because, during that season, the country was subject to a scorching easterly wind, which, like a fiery vapour, burnt up the grapes, if they were uncovered."

The authors of the Maison Rustique draw their precepts with regard to the method of cultivating vineyards in France, from the actual and most approved practice of Burgundy, Champagne, and Orleans, the wines of which countries are deservedly held in the highest estimation.

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Their directions for the choice of the soil, its situation, aspect, the manner of planting it, and the future cultivation of the vine, are so like to those of Columella, that it would be needless to repeat them here.—They are, indeed, more explicit as to the grafting of the vine, which is performed in cleft, as for many sorts of fruit trees, but with this difference, that a smooth part of the vine, at the distance of about seven or eight inches from the stem, and between two joints, is the most eligible part for inserting the cion, which, as repeatedly said before in other similar cases, should always be taken from the best bearing branch of the most fruitful vine. All small roots are cut away from about the place where the graft is to be inserted, and after it has been exactly fitted in the cleft, so as to make the inner bark of the cion coincide precisely with that of the stock, the wound is carefully bound up tight with slips of the inner bark of a young lime tree, of a willow, or with bass, in such manner as effectually to preserve it from the entrance of air or wet. The graft and its stock are then bent gently downward into a hole made on purpose to receive them, and are covered with earth so as to leave only two eyes of the cion above ground. The cion should be used as soon as possible after it has been cut, and its length should be about twelve inches.

Neither the middle sized vines, nor the low ones, of which two sorts all the best and principal vineyards in France consist, should be shaded by any neighbouring buildings, or trees. The tall vines in the southern provinces of France, such as Provence and Languedoc, are, like those in Piemont, Italy, and other very warm countries, reared up to trees, or formed into alcoves or arched walks, the better to defend them from the too scorching heat of the sun. The sorts thus planted are chiefly the Cioutat, the Corinth, the Damascus grape, and the Bourdelais. The vines about Auxerre are trained up against espaliers and trellises; but those of the lowest growth, of which most of the vineyards about Paris, Beaune, Tonnere, Chablis, &c. consist, are fastened only to common props, and are generally found to produce the greatest quantity of fruit, and, in some years, the best wine.

The people of Champagne, (who think that there is in the soil of their province a quality so peculiarly fit for the production of fine wine, as can never be found or imitated elsewhere,) plant their tallest vines in their middling lands, and the low ones in their best grounds. The former of these are reared to the height of four or five feet, and the latter to about three. They observe, that their vineyards yield the highest flavoured wine when they are most exposed to the sun; and therefore they always prefer a sloping situation, fully open to the south, for their best growths. They also prefer ground which is somewhat stony, and not naturally subject to much moisture. They manure this soil from time to time, by laying on dung and fresh earth; but with caution not to use too much dung, because that would render the wine flat and insipid, and apt to become ropy. They think cows dung better than that of horses, for their finest soils, because it is not so hot: but for stiff lands they use thoroughly rotted horse-dung, and sheep's dung, which they mix with about double the quantity of cow dung, to prevent its burning the roots of the vines. Towards the end of autumn, they spread in trenches cut across the vineyard, layers of this dung and of fresh earth, and after this mixture has remained there all the winter, to moulder, and grow mellow, they lay about half a basket full of it, early in the spring, to the roots of each vine, and particularly to those of the latest planted; making for that purpose a hole around it, deepest at its back, where the sloping ground is highest. This is done over the whole vineyard either every eight or tenth year, or, which amounts to the same, to an eighth or a tenth part of it each year.

The grapes most generally cultivated in Champagne are a small black sort; and to render the wine of that country the more perfect, great care is taken to root out all white ones, and such as, though black, are large and coarse: or, if those vines are not pulled up, they are grafted with such fruit as is desired.

About the end of June, and sometimes even in May, according to the forwardness of the vine, the upper end of each shoot is nipped off, in order that the greater quantity of nourishment may be conveyed to the fruit; for it is best that no part of a low vine be more than two feet and an half, or three feet, high from the ground. These low vines are earthed, as it is called, every spring; that is to say, they are inclined down into a hole dug close to them, and their shoots, being previously pruned to such lengths as are most consistent with the vigour of the vine, are covered with earth so as to leave only three or four of their eyes above the ground.---In Upper Picardy, it is the custom to renew, as it is termed, the vineyards every year, by burying the vines in this manner, and converting each branch into a layer.

It is a general rule, that the stronger the soil is, the farther asunder the vines should be planted; and that no layers, grafts, or cuttings should be used, but such as have a smooth shining bark, and of which the wood is of a clear green when cut. Those that are of a brown green, when a little bit of their rind is raised up with a knife, are rejected, as good for nothing.

To guard against the bad effects of frosts and fogs, the French vine-dressers, whenever they apprehended any danger of that kind, lay along that side of the vineyard from whence the wind blows, a ridge of dry litter, or straw, which they then burn slowly: but if, notwithstanding this, the vines are frozen, they cut them down very low, to enable them to bear the better the next year.

They hold it to be necessary, after a thick fog, to water their vines with juice of the roots or leaves of wild cucumbers, or with powdered coloquintida, mixed with water; and they are also of opinion that late pruning is frequently a means of guarding against the mildew, because their vines do not then blossom till the sun is become very powerful.

Careful husbandmen never suffer any one to go into their vineyards very early in the morning when dews or damps fall in May, June, or September; because the dew of those months, being generally cold, would blister the leaves of the vines if it were to be touched, and thereby fixed upon them before the rising of the sun, which afterwards removes that danger by drying up and exhaling the moisture: neither do they allow them to be entered, on any account, immediately after a hasty spring-shower, while the leaves are yet wet therewith, or when they are covered with a rime or hoar-frost.

Sea-water, salt and water, or stale urine mixed with dung and earth, are of excellent service to vines which do not bear well, and to those whose leaves turn red for want of moisture: and it is said that, when their leaves become white and dry, when their wood swells, and when their fruit drops off, all which are symptoms of decay, they are recovered by rubbing the stem, and watering their roots, with ashes reduced to powder and mixed with strong vinegar.---It is most certain that stirring of the ground around them, and keeping it in a fine loose state, will have this desirable effect; or rather it will keep them constantly in so vigorous a condition, that there will never be occasion to recur to other means to promote their fertility: neither will there, if this essential principle of vegetation is duly applied to, be any danger of the grapes shrivelling or growing dry upon the vine; to remedy which, if it should happen through careless management, the authors before quoted direct to pull off all the fruit thus injured, and to water the roots of the vine with stale urine. They add, that if the grapes rot upon the vine before they are ripe, some old ashes, or barley-meal, should be laid around the stem.

If the vines, as was before observed of other trees, are sprinkled with water in which tanners have dressed their hides, no cattle will touch them.

The young leaves and fruit of the vine are often greatly injured by very small green flies, which conceal themselves in the young buds, and weave there a thin web, not unlike to that of a spider, in which they deposit their eggs. All these webs, and the leaves on which the eggs have been laid, as well those which still adhere to the vine, as those which have fallen off, must be carefully collected, and burnt out of the vineyard.

As snails and slugs, which do great damage to the vines, generally hide themselves during the middle of the day, they should be carefully picked up early in the morning, or just after dew or a shower of rain has fallen, especially in in the ſpring and autumn, which are the ſeaſons when they appear moſt; and they ſhould be cruſhed to death, or burnt.

The vine-fretters, which the French call gribouris, abound moſt in the lighteſt land. When a vine is attacked by theſe inſects, its ſhoots are ſhort and meagre, its leaves are full of holes, and it yields but very little fruit, and that extremely poor, though never ſo great pains be taken to cultivate it. Theſe inſects are much ſmaller than the ſmalleſt gnats, which they reſemble both in ſhape and colour. They prey upon the vine during the whole year; for, in September, they get into the ground, and there gnaw its roots, eſpecially thoſe of young plants; and in May when the buds of the vine ſwell, they leave their former holes, feed upon the ſurface of thoſe buds, and then upon the leaves, and afterwards they fix upon the grapes, pierce their ſkin, ſuck out their juice, and lay in them their eggs, from whence proceed an infinite number of little worms, which complete the deſtruction of the fruit by the time it ſhould be gathered. To prevent this miſchief, the authors of the Maiſon Ruſtique adviſe the ſowing of a few patches of beans in different parts of the vineyard; becauſe theſe pernicious inſects will then reſort to them, and may conſequently be deſtroyed by plucking up the beans and burning them.

To get rid of numbers of other inſects, all of which endeavour to find a place of ſhelter when the winter approaches, either by creeping into the ground, or into dung, or any litter that lies upon it; they recommend the method before-mentioned, of laying a little heap of haulm, ſtraw, or any kind of mulch, round the ſtem of each vine when the weather begins to be froſty, and burning it in the ſpring, in a place out of the vineyard. Innumerable multitudes of vermin will be deſtroyed by this means: but, to render the remedy effectual, the neighbours all around muſt have recourſe to the ſame expedient, or theſe pernicious creatures will ſoon ſpread a-new from one vineyard to another.

Mr. Miller's method of guarding againſt flies, and waſps, which are often ſo very numerous, and voracious, as entirely to eat up all the fineſt and higheſt flavoured berries of well ripened grapes, deſerves much attention even in vineyards, though it is more eaſily practiſed in gardens; but the preventing of this miſchief will make ample amends for yet greater trouble. It is, before the grapes are quite ripe, and conſequently before they will be in much danger of being attacked by theſe enemies, to hang upon the vines, from ſpace to ſpace (the nearer the better), phials half filled with ſugared water, and rubbed at the neck with a little honey. Theſe will attract the waſps and flies, which, in attempting to get at the liquor, will fall into the phials, and be drowned. They muſt be carefully looked over every third or fourth day, to take out and deſtroy the flies and waſps, and to repleniſh them with liquor.

If, when the fruit is ripe, the ſtalks of the bunches are cut half through, about a fortnight before they are gathered, the juice of the grapes will be much improved thereby; becauſe, as not near ſo great a quantity of nouriſhment can afterwards enter the fruit, the watery particles will have time to evaporate, and the juice will be the better digeſted. This is practiſed by ſome of the moſt curious huſbandmen in the ſouth of France. But if, after the bunches are cut off the vines, they are hung up in a dry room, upon ſtrings, ſo as not to touch each other, for a month before they are preſſed, both the ſtrength and the flavour of the wine will be yet more exalted. To this, in a great meaſure, is owing the delicious richneſs of the vines of that part of the Tiroleſe which borders on Italy, where it is the conſtant cuſtom to keep the grapes for ſome time before they are uſed.

As we have already enumerated the different ſpecies of grapes, it will be needleſs to repeat it here; but refer the reader to that account, which he will find under the article GRAPE.

When a vineyard is planted in a ſtrong ſoil, it ſhould conſiſt of morillons, otherwiſe called white and black pineaus; but there ſhould be more of the latter than of the former, and they ſhould be intermixed with treſſeaus, otherwiſe called Burgundy grapes.

The pineau does not attain to its full perfection in ſtrong lands, though the ſeaſon be never ſo hot: for, notwithſtanding all the help that can be given it in ſuch a ſoil, it ſtill wants that undefinable ſomewhat, without which no grape can yield a delicate wine: whether it be, that, in imbibing its nouriſhment from the earth, its juices retain a portion of the moiſture which is natural to that earth, and which blunts the ſpirits of the wine; or that, as experience has ſhewn in very many caſes, though the heat be as great as poſſible, a ſtrong ſoil does not yield to the grape that ſort of juice which acquires a fine high flavour, and a racy vinous quality, by fermentation. Thus, it is known from facts, that the Madeira grape planted in a rich valley, no longer yields the ſame wine it does on its native rock. Yet the pineau is the only grape that ſhould be planted in a ſtrong land; becauſe it ripens earlier than others, and always yields a ſure crop.

If ſome plants of the treſſeau, whoſe fruit never ripens eaſily, are mixed with the pineaus, it is, ſays the authors of the Maiſon Ruſtique, becauſe our forefathers, having found by experience that the pineaus cannot of themſelves yield in ſuch a ſoil, wine which has a ſufficient body to keep long, judged it neceſſary to add theſe treſſaus, which, though they ripen very ſlowly, never fail to yield that ſort of wine which, without being ſpirituous, is, on the contrary, thick and heavy, which is the ſtate it ſhould be in when produced by ſtrong land, in order to its becoming good.

In a ſandy ſoil, whether it be coarſe or light, pineaus, and eſpecially the white ſort, are the vines moſt proper for planting. The meunier, or miller grape, delights in light ſands; and coarſe ſands agree with the meliés, otherwiſe called melon grapes, whether theſe be white, black, or green. In the diſtrict of Auxerre, theſe ſands, though naturally warmer than the ſtrongeſt land, do not, for all that, yield equally good wine: (theſe ſtrong lands are here ſuppoſed to be ſuch as were before adviſed, and their expoſition good.) This is what experience teaches us daily with regard to ſands, which, furniſhing no rich nutriment to the vine, yields only grapes whoſe juice is flat and inſipid, and not ſo ſugary as thoſe of ſtrong lands.

To theſe pineaus are therefore joined the meliés, as before ſaid. The white melié is a good grape, and yields greatly: the black is leſs ſo. Theſe ſorts of grapes become excellent (ſo far as their nature permits) in theſe ſands, which, being much warmer than they are ſubſtantial, ſuit the nature of the meliés, which require a great heat to ripen them. Theſe grapes yield a wine which is not apt to turn yellow.

Upwards of two thirds of the vines planted in ſuch ſands, in France, are thoſe of white grapes; becauſe it is the cuſtom of thoſe places to make more white wine than red.

A reaſonable proportion of the treſſeau grape ſhould always be planted with the others in ſandy ſoils: not that it ever attains to perfection there; but that, by mixing it with thoſe other grapes, whoſe juice acquires only a moderate ſweetneſs in ſuch ground, they may be enabled to yield wine which has a good body.

As to ſtony lands, thoſe which abound in blackiſh and large ſtones, and of which the earth is reddiſh and ſomewhat moiſt, muſt be treated in the ſame manner as ſtrong ſoils.

Thoſe which have ſmaller and white ſtones, and of which the earth is leſs red, are better than the former. Beſides the white and the black pineaus, and a ſmall number of treſſeaus, theſe lands are planted with the beaunier; and all theſe grapes do well on them.

Stony land whoſe ſoil is yellowiſh, and where the ſtones are yet much leſs than the preceding, are ſtill better than them for the laſt mentioned ſorts of grapes: for theſe do ſo well in a ſoil of this kind, that they always yield there a wine which is at leaſt pleaſant. They may be intermixed here with a few plants of muſcats and of chaſſelas: for theſe will acquire maturity enough to be of ſervice to the others, and will help to make their wine keep the longer.

Stony lands, which have otherwiſe a mellow and good ſoil, yield the beſt and fineſt flavoured wine when they are planted with pineaus; and in this caſe the number of the white grapes of this ſpecies ſhould greatly exceed that of the black. Thoſe from which the grayiſh wine, commonly called

called partridge's eye, is desired, should be planted chiefly with ferviniens, and here and there a few muscats and chasselas; but no tresseaus.

When such lands as these are intended for red wines, they should be planted with more black pineaus than white, with some ferviniens, and with a few tresseaus. These will yield a strong and mellow wine.

EXPERIMENTS on the CULTURE of the VINE.

Extract of a letter from M. Reussel in Brie, to M. Du Hamel, written in the year 1755.

" I have begun to try the New Husbandry upon the vine. It is hard to pay at least one hundred and twenty livres (five guineas) a year, for dressing an arpent (about an acre and one fifth) of vineyard, to have only our poor Brie wine; especially when the vines are entirely frozen, as they were last year, or laid bare to the very wood, by hail, as was the case in August last. I am therefore trying to find out a way to manage vines, without being at the expence of dressing, or propping them, and by which they may be less exposed to the injuries of the weather, and less liable to be plundered by thieves. To this end, I pitched upon a spot of ground, about half an arpent in extent, which had formerly been a vineyard, but was grubbed up many years ago. I planted on it four hundred poplars, six feet asunder, in a quincunx form. As the roots of this tree are few and small, I thought that distance might be sufficient. At the foot of each of these trees, I planted two vine cuttings, one on each side. The alleys are plowed, in order to their being sown alternately, with corn, or pulse, such as lentils, beans, barley, oats, &c. the produce of which pays the expence of plowing. While the three feet on one side of the tree are sown, the three feet on the other side are plowed, at proper times and seasons; by which means, both sides of the tree, and consequently both the vines, receive in turns the benefit of the stirring of the ground. All my plants have taken well. I intend to let the vines run up the trees, without doing any thing to them; and shall wait with patience the event of their produce, which, be it more or less, will be so much clear gain, as it will not have cost me any thing. This method was immediately approved of by the country people hereabouts, several of whom are now following my example. What helped to give them this good opinion of it, so suddenly, was, the example of a vine, which chances to grow a league from hence, in the middle of a field, at the foot of a pear-tree, and which never is either pruned or cultivated. Last year, when all the vines of this country were so damaged by the frost, as not to produce any fruit at all; this vine escaped unhurt, and bore as many grapes as yielded a barrel of wine. If the future produce of my vineyard, which contains eight hundred vines, were to be estimated on this footing, it would amount to eight hundred barrels of wine every year. But as no one can be so absurd as to make such a calculation; so, on the other hand, I believe none will deny but that my vines, producing only the two hundreth part of that proportion, will yield me four barrels of wine, which will not have stood me in the least extraordinary charge. And even supposing them not to yield me any thing, still I shall lose nothing, because they will have cost me nothing. The four hundred poplars, which do not stand me in above a penny a-piece, (being planted only by slips, without making or digging either holes or trenches for them) cannot fail, in a soil that is quite fit for them, to be worth, twenty-five years hence, ten livres (eight shillings and nine-pence) apiece, or four thousand livres (one hundred seventy-five pounds four shillings) the whole; which will be an excellent payment for the ground they will have taken up. I do not, however, mean to extend this method to all my vineyards. In most of them, the soil, though fit for the vine, is too dry and stony for the poplar. In Italy, vines are frequently planted at the foot of mulberry and other trees. The only thing necessary in that case, is, to make the alleys of a breadth proportioned to the shade of the trees."

Experiment on the vine, cultivated according to the principles of the New Husbandry, with remarks thereupon, by M. de Chateauvieux.

" When I began to reflect attentively on the principles of the New Husbandry, I soon perceived that it might prove a means of perfecting the culture of our vineyards, as well as that of our other lands.

" I was the more readily induced to turn my thoughts towards that important branch of agriculture, as it seemed to me to have been too much neglected for a long time. I plainly saw, that our methods of cultivating the vine, were, in general, not only defective, but badly executed, and that, in the common way of planting vineyards, the produce could not be proportioned to the great expence.

" I shall not at present enter into a detail of the principles and motives of my new scheme for the culture of the vine: that task would be too long for this narrative: and I should likewise be glad first to see the advantages of my method confirmed by a series of experiments repeated for several years together. My different operations, and first success, are all that I shall mention now.

" Every country has in the culture of the vine, some practice or other peculiar to itself, and which is thought essential there, though it be rejected in other places. All agree in pruning the vine, and in stirring the earth round it: but neither of these operations is performed in the same manner every where.

" For the better understanding of my new culture, it is necessary that I should give an idea of the manner in which our vineyards are laid out and planted. Their exposition is generally to the east or south, on a good deep soil, which has a gentle declivity, or on the side of a hill. The whole surface of the ground is planted without order or symetry; so that the vines are, almost always, either too close together, or too far asunder: very few are at proper distances. As the old vines decay and perish, the chasms are filled up by layers from the next neighbouring vines. This is the general disposition of our vineyards, from which great inconveniences must necessarily arise: but I shall not enter into that detail.

" With regard to the culture of the vine, it is sufficient, for my present purpose, to observe, that the whole of that labour is now performed by hand, which renders it very expensive. I say nothing of the manner in which it is executed; that part having appeared to me so very defective, that I have been obliged to alter and correct it in every point.

" By this short preamble it may easily be seen, that, in order to improve the culture of the vine, and bring it to greater perfection, it was necessary that I should attend chiefly to the three following things. 1. To dispose the vines in a better manner, by planting them in strait lines, and at equal distances from each other. 2. To contrive that disposition so as to lessen the present expence of culture, by using a plough to stir the ground in one part of the vineyard, whilst the other should continue to be stirred with the spade. 3. To execute the several cultures of the vine, in such manner as to make them promote its vegetation more than they do in any of the common methods.

" I shall treat each of these articles separately.

" The disposition which seemed to me the most agreeable to the principles of the New Husbandry, by which I was guided, was to lay the vineyard out in beds, as we do fields for corn, observing to leave an alley between every two beds, and making each bed five feet wide, in order to plant it with three rows of vines, which, by that means, would be thirty inches asunder, and the vines at the same distance from each other in the rows.

" As to the alleys, I thought it would be right to make them also five feet wide: and what I shall say hereafter will shew, that about that breadth is necessary.

" However, as that disposition might not be the best, I tried others on small spots of ground, by planting the vines at other distances. Some were set in single rows three feet and an half asunder; others in double rows, and in beds, with alleys of three feet and an half between them. These plantations were made in the spring of 1753.

" But as I could not expect to see the event of these trials, till a considerable time after making them, eight or ten years, at least, being requisite to shew what the success would be, when the vines should be come to their full strength and bearing; I considered at the same time, by what means I might abridge an experiment which was to be of so long duration.

" To that end, I formed a bed of vines in a vineyard planted twenty-four years before. The vineyard was good,

good, and yielded plentiful crops. I made my bed five feet wide, and planted it by laying down stocks of the old vines, to make the two outward rows, leaving two feet and an half distance from one layer to another. The old vines, which happened to be pretty well situated, formed the middle row. The remainder of the bed, which is two hundred and forty feet long, was planted with layers.

"An alley, five feet wide, was made on one side of this bed, by pulling up the old vines within that distance. Some of these which were left, served to form a row of vines, ready against the making of a second bed parallel to the first. It is plain, that the making of a bed in this manner, requires a breadth of ten feet, viz. five feet for the vines, and five feet for the alley. This bed was thus made in November 1752.

"After I had seen the crop which it produced in 1754, I no longer hesitated to extend this experiment; and accordingly, in November of that year, I made three other beds, like the former, and close to it.

"I not only made no doubt but that the vines, being so disposed, and having an equal quantity of earth to draw their nourishment from, would thrive better than they do in our common method of cultivating them; but I likewise hoped that their being exposed on all sides to the influences of the sun and air, by means of the alleys, would facilitate their vegetation, and hasten the ripening of the grapes.

"The manner in which I propose distributing the vines, shews at once the possibility and facility of giving the alleys every necessary culture, with the same plough and the same cultivator as we use for the alleys of our corn fields. I have not found the least difficulty in the execution of this practice.

"The ground thus cultivated in the alleys, will be about a third part of the whole: the remaining two thirds will continue to be cultivated by hand, as usual; and the expence will be considerably diminished, by the dispatch with which the plough, or cultivator, will perform its part.

"The plough may be brought as near the vines as one pleases, provided care be taken not to damage them. An expert husbandman will easily know how to manage in that respect.

"Another diminution of the expence attending the common culture of vineyards is, that as, by the method which I propose, the number of vines will be fewer, they will of course require less labour, and therefore less cost; and the vine-dressers, meeting with no hindrances or obstructions between the vines planted regularly in rows, will do more work in a day, and that much better, than in the old way. There will also be less occasion for many things necessary to the vine, such as propping, tying up, dunging, &c. Consequently this new culture will prove a considerable saving.

"It is well known how much vines are hurt when too great a quantity of water is retained in the ground. It chills them too much, their juices become less exalted, numbers of weeds spring up, &c. These inconveniences will be remedied in a great measure, by means of the alleys, by cutting with the plough, as I have done, towards the beginning of winter, a furrow along each side of the bed. The water will drain off into that furrow, and the bed will retain only the degree of moisture necessary for the vines.

"I shall speak only of the two principal parts of the culture of the vine, viz. the pruning of it, and the stirring of the ground; and the time when each of these ought to be performed.

"Before I began to execute the alterations I had thoughts of making in this culture, I had endeavoured to make myself so far master of it, as to be the less in danger of miscarrying in my experiment.

"The custom of this country is, to prune the vine during and after winter; frequently beginning that work about the end of January. I always thought that a wrong season; and judged that it would be much better to prune the vine before winter, immediately after the vintage is ended. Experience has since shewed me that I was right.

"In November 1750, I pruned above fifty vines with my own hands: none of them suffered in the least by the winter's frost: they made strong and vigorous shoots, and produced a greater quantity of grapes than any of the neighbouring vines.

"The next year, and in the same month, I pruned the same vines again. This pruning had the same success as the year before. Encouraged by this repeated experience, I determined to make the bed before mentioned, in my old vineyard. The vines have continued to be pruned before winter, always with success, and without any sort of inconvenience.

"Satisfied with these first trials, I thought I might safely venture to extend the same practice to a larger extent of ground. I had about three acres of vines, which had produced very little wood for two years past. Their branches were so poor and slender, that they would scarce bear laying down: in short, the vineyard perished daily. I conceived hopes of recovering it by means of this pruning. Accordingly, I pruned it in November 1754; and in 1755, the vines produced stronger and longer shoots. As the branches would then bear laying down, I began to replenish part of the vacant places. By this means, my vineyard was replanted with young vines, and quite renewed, only by altering the time of pruning.

"This last pruning underwent a severe trial, from the excessive hard frosts of the winter of 1755: yet, intense as the cold was, my plants bore it, without being hurt at all. I then looked upon it as certain, that the vine might be pruned before winter, without any danger from the inclemency of that season.

"It was absolutely necessary that the vine should bear pruning at that time, in order to enable me to perform the other cultures in their proper and most favourable seasons.

"That the vine may be benefited as much as possible by every stirring of the earth about its roots, these stirrings ought certainly to be performed at the times when they may be most likely to excite the greatest vegetation. Let us see whether the common practice answers that end. The usual time of beginning to dress the vineyard is in the spring, immediately after pruning the vines. Three dressings are judged sufficient; and it is generally thought, that the last should be finished by midsummer. The plants are then left to shift for themselves, till the time of vintage, which is upwards of three months after. During this time, quantities of weeds generally shoot up, which shade the vines, and hinder the grapes from ripening as they ought. Careful husbandmen pull them up: but the greater part are unwilling to take that trouble.

"In the common way of cultivating the vine, the earth is first stirred when the buds are just ready to come out, and even after they are come out; a time always extremely critical, because the uncertainty of the season exposes the buds to several dangers, which are increased by that stirring of the earth, from whence many exhalations, oftentimes very pernicious, proceed at this season. Would it not be much better to let the vineyard rest while the vine is budding?

"The last stirring, which is given about mid-summer, is too long before the vintage, and therefore is almost always followed by great quantities of weeds. Might not this last culture be performed later?

"I have experienced that these inconveniences may be avoided, without falling into others. To this end, after the vine has been pruned, before winter, let the earth be first stirred in that season: the second stirring, which would otherwise be immediately after winter, may then be deferred till towards the end of May: and the third stirring may be given in the beginning of August, or about the end of July.

"This has been my method of cultivating my vines, ever since their being planted in beds. The beds are dug by hand, and the alleys are stirred with the plough or the cultivator.

"The first stirring before winter produces the same effect on the vineyards, as it does on our beds of corn. The water is drained off, and the winter's frosts penetrate the earth, divide it, and keep it loose and light.

"It remains in this state till towards the end of May, when it receives the first stirring after winter: and, to have a more certain rule to go by, the second stirring should not be given till after the props have been stuck, the vines have budded, and the shoots have been tied up to the props.

props. This ſtirring may be given, either a little ſooner, or a little later, than is mentioned above, according to the ſeaſon. Sometimes one may be obliged to haſten it, if the ground is greatly burdened with weeds: but at whatever time it be performed near the end of May, it is certain that the vine will then have made great ſhoots, and that without having been diſturbed by any ſtirring of the earth during the time of its tender vegetation. As I have tried this culture in hot and very dry years, I have ſeen that the earth has not grown hard, but has retained the neceſſary degree of moiſture, ſo as to be ſtirred with the greateſt eaſe.

"The third ſtirring, which is the ſecond after winter, being deferred till towards the end of Auguſt, or at leaſt till the end of July; weeds have not time to grow in any quantity between that and the ſeaſon of the vintage: and what will render it ſtill more beneficial, is, that this is the time when the grapes fill moſt, and are drawing towards a ſtate of maturity.

"I may perhaps be thought not to enlarge enough on ſo important a ſubject as this is. It will, I confeſs, require being treated more fully hereafter: but in the mean time I beg the reader to conſider, that I am now relating only the ſucceſs of my firſt trials.

Good effects of this culture proved by the produce of a bea of vines two hundred and forty feet long, planted in 1752.

"I obſerved, in the beginning of this account, that every culture of the vine is performed with much greater eaſe and expedition in vineyards laid out in beds, than in thoſe which are planted all over; but at random. The very ſituation of the vines planted regularly in beds, is ſufficient to ſhew with what eaſe every thing that they require may be done, and that they muſt, of courſe, be well cultivated in every reſpect.

"In the next place, the pruning of the vine, and the firſt ſtirring of the earth before winter, are done at a time when the buſineſs of the field is over, and huſbandmen are, in ſome meaſure, un-occupied. That time, which would otherwiſe be in a manner loſt, may now be employed to very great advantage; and in conſequence of their being advanced in their work before the coming on of winter, inſtead of being over-loaded in the ſpring, by a multitude of things to be done at that time, they will have ample leiſure to attend properly, and without being hurried, to every branch of culture that a farm requires.

"The effect of our culture has been extremely viſible. The new vines have grown ſo prodigiouſly, that they now greatly ſurpaſs thoſe of the old vineyards, which they were part of: the ſhoots too are thicker and longer, and the bunches of grapes bigger and more numerous.

"When I firſt began to apply the principles of the New Huſbandry to the culture of the vine, I hoped indeed that the great fruitfulneſs of a ſmaller number of plants, might compenſate for the loſs of thoſe I was obliged to retrench: but I was agreeably ſurpriſed to find all the vines of my bed loaded with an equal quantity of grapes.

"Though my conjecture was founded on principles which I knew to be true, I was ſtill farther confirmed in my opinion by an obſervation I had made, that, even in our beſt vineyards, there are always great numbers of vines which abſolutely bear no fruit at all, and many others which produce but very little; ſo that it is not on the great number of plants that the great produce of the vineyard depends, but on the goodneſs of thoſe plants.

"Accordingly I concluded that I ought not to look upon my having taken up ſome vines in order to form the ally, as a loſs, provided thoſe in the bed were enabled by good culture to yield their utmoſt productions. The event ſhewed that I was right.

"I likewiſe judged, that the grapes would ripen more perfectly in this new way, than in the old: and in that too I was not miſtaken; for they were much higher flavoured, and made far better wine.

"Beſides theſe advantages, this culture preſerved my vines from a very bad accident, which happens frequently, eſpecially when the autumn is rainy: I mean, the rotting of the grapes. In our common vineyards, the grapes ripen, ſmothered beneath that quantity of leaves with which the vines are loaded, and ſurrounded by numbers of weeds, which often grow higher than the vines themſelves. Add to this, that the air around them is filled with various exhalations from the earth, which, for want of a free circulation, remain ſuſpended about the plants. Theſe cauſes cannot but make the grapes rot, and the wine that is made of them, muſt be greatly inferior to what it would otherwiſe be.

"Our vines in beds, being much leſs, if at all, liable to any of theſe accidents, will have the advantage of preſerving their grapes ſound and without rottenneſs, till they are perfectly ripe. This I have already experienced, at a time when above half the grapes of my old vineyard were abſolutely rotten.

"Notwithſtanding all the advantages of this new method, which, I may ſay, I have only glanced at; they would probably not be regarded, if they were not attended with greater fruitfulneſs than is obtained in the common way. I ſhall therefore ſhew, that the produce of my young vines was very conſiderable, and greatly ſuperior to that of my old vineyard.

"My bed, as I obſerved before, was formed in November 1752; and the two outward rows conſiſted, in a great meaſure, of young layers, which not being old enough in 1753, to bear much fruit, I could not expect any great matter from them that year. However, they bore as much as could reaſonably be deſired. A violent ſtorm of hail which fell in June, left ſcarce any thing to be gathered in all our other vineyards.

"The year 1754 produced, in general, but little wine. The young plants of my bed, being then only in their ſecond year, were too weak to diſtinguiſh themſelves by any extraordinary quantity of fruit; though their vigour gave great hopes for future years. However, even in this, they were loaded with ſo many and ſo large bunches of grapes, that they yielded rather more wine than the old vines which were next them.

"The year 1755 was one of the beſt years for wine, that has been known for a long time. The quantity was plentiful, and the quality exceeding good. The youngeſt plants of my bed, which were only in their third year, ſeemed no way inferior to the old vines cultivated in the common way.

"This bed, two hundred and forty feet long, and ten feet wide, including the alley, yielded three hundred and thirty-ſix pints of wine, Paris meaſure (eighty four Engliſh gallons), which was after the rate of two-fifths more than I had from my old vineyard; or to explain myſelf ſtill better, if my whole vineyard had been laid out in beds, it would have yielded five barrels of wine, for every three that it did yield.

"Twenty beds of the ſize of that we are ſpeaking of, would make about an arpent; and ſuppoſing them all to produce alike, they would, after the rate of this, yield ſix thouſand ſeven hundred and twenty Paris pints (one thouſand ſix hundred and eighty Engliſh gallons), or twenty-eight hogſheads; which, in this country (the territory of Geneva,) is a prodigious quantity; ſuch as no vineyard here has ever yet produced.

"The vintage of 1756 was neither plentiful nor good. I therefore did not make any compariſon; but remained ſatisfied with obſerving in general, that my bed yielded at leaſt as much as the old vineyard."

VINEGAR, an acid penetrating liquor, prepared from wine, cyder, beer, &c. of conſiderable uſe both as a medicine and ſauce.

The proceſs of turning vegetable matters to vinegar, is thus delivered by Dr. Shaw: take the ſkins of raiſins, after they have been uſed in making wine; and pour three or four times their own quantity of boiling water upon them, ſo as to make a thin aqueous mixture. Then ſet the containing caſk, looſely covered, in a warmer place than is uſed for vinous fermentation; and the liquor in a few weeks time will become a clear and ſound vinegar; which being drawn off from its ſediment, and preſerved in another caſk, well ſtopped down, will continue perfect, and fit for uſe.

This experiment ſhews us a cheap and ready way of making vinegar from refuſe materials; ſuch as the huſks of grapes, decayed raiſins, the lees of wine, grounds of ale, beer, &c. which are frequently thrown away as uſeleſs. Thus, in many wine countries, the marc, rape, or dry preſſing of grapes, are thrown in heaps, and ſuffered to putrify unregarded, though capable of affording as good vinegar as the wine itſelf. In ſome places they bury copper-

copper-plates in these husks, in order to make verdigrease; but this practice seems chiefly confined to the southern parts of France. Our present experiment shews us how to convert them to another use; and the direction extends to all the matters that have once undergone, or are fit to undergo, a vinous fermentation, for that all such matters will afford vinegar. Thus all our summer-fruits in England, even black-berries; all the refuse washings of a sugar-house, cyder-pressings, or the like, will make vinegar, by means of water, the open air, and warmth.

The whole process, whereby this change is effected, deserves to be attentively considered; and, first, the liquor to be thus changed, being kept warmer than in vinous fermentation, it begins, in a few days, to grow thick or turbid; and without throwing up bubbles, or making any considerable tumult, as happens in vinous fermentation, deposits a copious sediment.

The effect of this separation begins to appear, first, on the surface of the liquor, which gathers a white skin, that daily increases in thickness, till at length it becomes like leather; and now, if continued longer in this state, the skin turns blue, or green, and would at last grow solid, and putrify: therefore, in keeping down this skin as it grows, and thrusting it gently down to the bottom of the vessel, consists much of the art of vinegar making, especially from malt. For the difference between vinous and acetous fermentation, *see the article* FERMENTATION.

*Method of making Cyder-*VINEGAR. The cyder (the meanest of which will serve the purpose) is first to be drawn off fine into another vessel, and a quantity of the must, or pouz of apples, to be added: the whole is set in the sun, if there be a conveniency for the purpose; and, at a week or nine days end, it may be drawn off. *See* CYDER.

*Method of making Beer-*VINEGAR. Take a middling sort of beer, indifferently well hopped; into which, when it was worked well, and is grown fine, put some rape, or husks of grapes, usually brought home for that purpose: mash them together in a tub; then, letting the rape settle, draw off the liquid part, put it into a cask, and set it in the sun as hot as may be (the bung being only covered with a tile, or slate-stone) and in about thirty or forty days, it will become a good vinegar, and may pass in use as well as that made of wine, if it be refined, and kept from turning musty.

Or thus: to every gallon of spring-water, add three pounds of Malaga-raisins; which put into an earthen jar, and place them where they may have the hottest sun from May till Michaelmas; then pressing all well, tun the liquor up in a very strong iron-hooped vessel, to prevent its bursting: it will appear very thick and muddy, when newly pressed; but will refine in the vessel, and be as clear as wine.

Thus let it remain untouched for three months, before it be drawn off, and it will prove excellent vinegar.

*Method of making Wine-*VINEGAR. Any sort of vinous liquor, being mixed with its own fæces, flowers, or ferment, and its tartar, first reduced to powder; or else with the acid and austere stalks of the vegetable from whence the wine was obtained, which hold a large proportion of tartar: and the whole being kept frequently stirring in a vessel which has formerly held vinegar, or set in a warm place full of the steams of the same, will begin to ferment a-new, conceive heat, grow sour by degrees, and soon turn into vinegar.

The remote subjects of acetous fermentation are the same with those of vinous; but the immediate subjects of it are all kinds of vegetable juices, after they have once undergone that fermentation which reduces them to wine: for it is absolutely impossible to make vinegar of must, the crude juice of grapes, or other ripe fruits, without the previous assistance of vinous fermentation.

The proper ferments for this operation, whereby vinegar is prepared, are, 1. The fæces of all acid wines. 2. The leys of vinegar. 3. Pulverised tartar; especially that of Rhenish wine, or the cream, or crystals thereof. 4. Vinegar itself. 5. A wooden vessel well drenched with vinegar, or one that has been long employed to contain it. 6. Wine that has often been mixed with its own fæces. 7. The twigs of vines, and the stalks of grapes, currants, cherries, and other vegetables of an acid austere taste. 8. Bakers leaven, after it is turned acid. 9. All manner of ferments, compounded of those already mentioned.

The French use a method of making vinegar different from that above described. They take two large oaken vessels, the larger the better, open at top; in each whereof they place a wooden grate, within a foot of the bottom: upon these grates they first lay twigs, or cuttings of vines, and afterwards the stalks of the bunches, without the grapes themselves, or their stones; till the whole pile reaches within a foot of the brim of the vessels: then they fill one of these vessels with wine to the very top, and half fill the other; and with liquor drawn out of the full vessel, fill up that which was only half full before; daily repeating the same operation, and pouring the liquor back from one vessel into another; so that each of them is full, and half full, by turns.

When this process has been continued for two or three days, a degree of heat will arise in the vessel, which is then but half full, and increase for several days successively, without any appearance of the like in the vessel which happens to be full, during those days; the liquor whereof will still remain cool: and as soon as the heat ceases in the vessel that is half full, the vinegar is prepared: which, in the summer, happens on the fourteenth or fifteenth day from the beginning; but in the winter, the fermentation proceeds much slower: so that they are obliged to forward it by artificial warmth, or the use of stoves.

When the weather is exceeding hot, the liquor ought to be poured off from the full vessel into the other twice a-day: otherwise, the liquor will be overheated, and the fermentation prove too strong; whence the spirituous parts will fly away, and leave a vapid wine, instead of a vinegar, behind.

The full vessel is always to be left open at the top, but the mouth of the other must be closed with a cover of wood, in order the better to keep down and fix the spirit in the body of the liquor; otherwise, it might easily fly off in the heat of fermentation. The vessel that is only half full seems to grow hot, rather than the other, because it contains a much greater quantity of the vine-twigs and stalks, than that, in proportion to the liquor; above which the pile, rising to a considerable height, conceives heat the more, and so conveys it to the wine below.

Vinegar is a medicine of excellent use in all kinds of inflammatory and putrid disorders, either internal or external: in ardent bilious fevers, pestilential and other malignant distempers, it is recommended by Boerhaave as one of the most certain sudorifics. Weakness, fainting, vomiting, hysterical and hypocondriacal complaints have also been frequently relieved by vinegar applied to the mouth or nose, or received into the stomach. Distilled vinegar has the same virtues, only in a stronger degree.

There are also medicated vinegars, as vinegar of antimony, of elder, litharge, roses, squills, treacle, &c. which derive their chief virtues from the vinegar.

VINEYARD, *Vinetum*, a plantation of vines without the assistance of walls, &c. *See* VINE.

VINOUS, something that relates to wine, or that hath the taste and smell of it.

VINTAGE, a crop of grapes, or the produce of a vineyard each season.

VIPER, the name of a well known serpent, common in many parts of England.

The bathing the part bit by a viper with olive oil, is said to effectually prevent the fatal consequences, that would otherwise attend it.

VIVES, a disease in horses, which differs from the strangles only in this, that the swellings of the kernels under the ears of the horse (which are the parts at first chiefly affected) seldom gather, or come to matter, but by degrees perspire off, and disperse, by warm cloathing, anointing with the marshmallow ointment, and a moderate bleeding or two. But should the inflammation continue, notwithstanding these means, a suppuration must be promoted by the methods recommended in the strangles. *See the article* STRANGLES.

When these swellings appear in an old or full-aged horse, they are signs of great malignity, and often of an inward decay, as well as forerunners of the glanders.

The mercurial ointment mentioned in the article STRANGLES may be prepared thus:

> Take of crude mercury, or quickfilver, one ounce; Venice-turpentine half an ounce; rub together in a mortar till the globules of the quickfilver are no longer vifible; then add two ounces of hogs-lard.

Some authors recommend this ointment to be ufed at firft, in order to difperfe the fwellings, and prevent their coming to matter; bleeding and purging at the fame time for that purpofe; but as in young horfes they feem to be critical, the practice by fuppuration is certainly more eligible and fafe; for want of properly effecting which, the humours frequently fettle, or are tranflated to the lungs, and other bowels; or falling on the flefhy parts of the hind quarters, form deep impoftumes between the mufcles, which difcharge fuch large quantities of matter, as fometimes kill the horfe, and very often endanger his life. *Bartlet's Farriery, pag.* 99.

ULCER, a folution of the foft part of an animal body, together with the fkin.

The firft intention in the cure of ulcers is bringing them to digeft, or difcharge a thick matter; which will in general be effected by the green ointment, or that with precipitate; but fhould the fore not digeft kindly by thefe means, but difcharge a gleety thin matter, and look pale, you muft then have recourfe to warmer dreffings, fuch as balfam, or oil of turpentine, melted down with your common digeftive, and the ftrong beer poultice over them; it is proper alfo in thefe kind of fores where the circulation is languid, and the natural heat abated, to warm the part, and quicken the motion of the blood, by fomenting it well at the time of dreffing; which method will thicken the matter, and roufe the native heat of the part, and then the former dreffings may be re-applied.

If the lips of the ulcer grow hard or callous, they muft be pared down with a knife, and afterwards rubbed with the cauftic.

Where foft fungous flefh begins to rife, it fhould carefully be fuppreffed in time, otherwife the cure will go on but flowly; if it has already fprouted above the furface, pare it down with a knife, and rub the remainder with a bit of cauftic; and to prevent its rifing again, fprinkle the fore with equal parts of burnt allum, and red precipitate; or wafh with the fublimate water, and drefs with dry lint even to the furface, and then rowl over a comprefs of linnen as tight as can be borne; for a proper degree of preffure, with mild applications, will always oblige thefe fpongy excreffences to fubfide, but without bandage the ftrongeft will not fo well fucceed.

All finuffes, or cavities, fhould be laid open as foon as difcovered, after bandages have been ineffectually tried; but where the cavity penetrates deep into the mufcles, and a counter opening is impracticable or hazardous; where by a continuance, the integuments of the mufcles are conftantly dripping and melting down; in thefe cafes injections may be ufed, and will frequently be attended with fuccefs. A decoction of colcothar boiled in forge-water; or folution of lapis medicamentofus in lime-water, with a fifth part of honey and tincture of myrrh, may be firft tried, injecting three or four ounces twice a day, or fome refin melted down with oil of turpentine may be ufed for this purpofe: if thefe fhould not fucceed, the following, which is of a fharp and cauftic nature, as recommended on Mr. Gibfon's experience.

> Take of Roman vitriol half an ounce, diffolve in a pint of water, then decant and pour off gently into a large quart bottle; add half a pint of camphorated fpirit of wine, the fame quantity of the beft vinegar, and two ounces of Ægyptiacum.

This mixture is alfo very fuccefsfully appplied to ulcerated greafy heals, which it will both cleanfe and dry up.

Thefe finuffes or cavities frequently degenerate into fiftulæ, that is, grow pipey, having the infide thickened, and lined as it were with a horny callous fubftance. In order to their cure, they muft be laid open, and the hard fubftance all cut away; where this is impracticable, fcarify them well, and truft to the precipitate medicine made ftrong, rubbing now and then with cauftic, butter of antimony, or equal parts of quickfilver and aqua fortis.

When a rotten or foul bone is an attendant on an ulcer, the flefh is generally loofe and flabby, the difcharge oily, thin, and ftinking, and the bone difcovered to be carious, by its feeling rough to the probe paffed through the flefh for that purpofe. In order to a cure, the bone muft be laid bare, that the rotten part of it be removed; for which purpofe, deftroy the loofe flefh, and drefs with dry lint; or the doffils may be preffed out of tincture of myrrh or euphorbium: the throwing off the fcale is generally a work of nature, which is effected in more or lefs time, and in proportion to the depth the bone is affected; though burning the foul bone is thought by fome to haften its feparation.

Where the cure does not properly fucceed, mercurial phyfick fhould be given, and repeated at proper intervals: and to correct and mend the blood and juices, the antimonial and alterative powders, with a decoction of guaiacum and lime-waters, are proper for that purpofe. *Bartlet's Farriery, pag.* 253.

ULIGINOUS, an appellation given to a moift, moorifh, and fenny foil.

UMBEL, the extremity of a ftalk or branch of a plant, divided into feveral peduncles, or rays, beginning from the fame point, and opening in fuch a manner, as to form an inverted cone.

UMBELLIFEROUS *Plants*, thofe whofe flowers are produced in an umbel, on the top of the ftalks, fomewhat refembling an umbrella. Of this kind are the fennel, parfley, parfnip, carrot, hemlock, &c.

UNDERWOOD, coppice, or any wood not accounted timber. *See the article* COPPICE.

VOOR, fallow land. *See the article* FALLOW.

URE, the udder of a cow, fheep, &c.

URITH, etherings, or windings of hedges.

URRY, a fort of blue or black clay, lying near a vein of coal.

URINE, a ferous and faline matter feparated from the blood of animals, and emitted by the canal of the urethra.

It is of excellent ufe as a manure, when deprived of its hot fiery particles by time, which will fo alter its nature as to render it an extraordinary fertilizer of every kind of foil. Columella certifies that old urine is excellent for the roots of trees. Mr. Hartlib commends the Dutch for preferving the urine of cows as carefully as they do the dung, to enrich their lands; and inftances a woman he knew near Canterbury, who faved in a pail all the urine fhe could, and when the pail was full, fprinkled it on her meadow, the grafs of which looked yellow at firft, but afterwards grew furprizingly. Similar to this is what Mr. Bradley relates, as of his own knowledge. Human urine was thrown into a little pit conftantly every day, for three or four years. Two years after, fome earth was taken out of this pit, and mixed with twice as much other earth, to fill up a hollow place in a grafs walk. The turf which was laid upon this fpot grew fo largely and vigoroufly, befides being much greener than the reft, that, by the beft computation he could make, its grafs, in a month's time, was above four times as much in quantity as that of any other fpot of the fame fize, though the whole walk was laid on very rich ground. The author of the Englifh Improver is therefore very right in faying, that human urine is of greater worth, and will fatten land more, than is generally imagined by our farmers, whom he advifes, to take all opportunities of preferving this, and every fort of urine, for their ground, as carefully as is done in Holland.

USTILAGO, the fame with burnt grain. *See the article* BURNT-GRAIN.

UTENSIL, a domeftic moveable of any kind.

W.

WAD, black lead.

WAGGON, a vehicle or carriage, of which there are various forms, accommodated to the different uſes they are intended for. *See the article* WHEEL.

WAIF, an eſtray, which, for want of the owner's appearance after it has been cried and publiſhed in the neighbouring markets, is forfeited to the lord of the manor.

WALK, an ornamental and uſeful part of a garden, differing from an alley by being wider. *See* ALLEY.

Walks are either ſtrait or ſerpentine; the materials of which they are formed are gravel, ſand, or graſs; but where gravel or ſand cannot be procured, they are ſometimes laid with powdered coal, ſea-coal aſhes, and ſometimes with powdered brick, but none equals thoſe made with gravel: and in order to the laying thoſe kind of walks, it is very proper to fill the bottom with lime, rubbiſh, flint ſtones, coarſe gravel, or other rocky materials, which will be of ſervice to prevent weeds from growing through the gravel, and to hinder worm-caſts; this bottom ſhould be ten inches or a foot thick, over which a coat of fine gravel, mixed with a due proportion of loam, ſhould be laid, to the thickneſs of ten inches. The common allowance for a gravel walk of five feet breadth is an inch in the crown, ſo that if a walk be twenty feet wide, it ſhould be four inches higher in the middle than on each ſide.

When a walk has been evenly laid, trodden down, and raked, it ſhould then be rolled well both in length and width; and in order to make them more firm, it will be neceſſary to give them three or four water-rollings, that is, they ſhould be rolled when it rains very faſt; this will cauſe the gravel to bind, ſo that when the walks come to be dry, they will be as hard as terrace.

Gravel walks are not only very neceſſary near the houſe, but there ſhould always be one carried quite round the garden, becauſe being ſoon dry after rain, they are proper for walking on in all the ſeaſons; but then theſe ſhould be but few, and thoſe adjoining to the houſe ought to be large in proportion to the ſize of the houſe and garden: the principal of theſe walks ſhould be elevated, and carried parallel with the houſe ſo as to form a terrace; this ſhould extend itſelf each way in proportion to the width of the garden, ſo that from this there may be a communication with the ſide walks, whereby there may be dry walking all round the garden.

Sand walks are alſo frequently made in gardens; theſe are leſs expenſive in the making, and alſo in keeping in order than thoſe of gravel; for as the greateſt part of the walks which are made in modern gardens twiſt about in an irregular ſerpentine manner, it would be very difficult to keep them handſome if they were laid with gravel, eſpecially where they are ſhaded by trees; for the dripping of the water from their branches in hard rains, is apt to waſh the gravel in holes, and render the walks very unſightly; therefore thoſe walks which go through woods and plantations are much better if laid with ſand, which will be dry and wholſome, and whenever they appear moſſy, or any weeds begin to grow on them, if they are ſcuffled over with a Dutch hoe in dry weather, and raked ſmooth, it will deſtroy the moſs and weeds, and make the walks appear as freſh and handſome as when firſt laid.

The breadth of theſe walks ſhould be proportioned to the ſize of the ground, which, in a large extent, may be twelve or fourteen feet wide, but in ſmall gardens five or ſix will be ſufficient.

The ground being traced out in the manner as the walks are deſigned, the earth ſhould be taken out of the walk, and laid in the quarters; the depth of this muſt be proportioned to the nature of the ſoil, for where the ground is dry, the walks need not be elevated above the quarters, ſo the earth may be taken out four or five inches deep in ſuch places; but where the ground is wet, the bottom of the walks need not be more than two inches below the ſurface, that the walks may be raiſed ſo high as to throw off the wet into the quarters, which will render them more dry and healthy to walk on: after the earth is taken out, the bottom of the walks ſhould be laid with rubbiſh, coarſe gravel, &c. to the thickneſs of five or ſix inches, and beaten down cloſe, to prevent the worms from working through it; then the ſand ſhould be laid upon this about three inches thick, and after treading it down, it ſhould be raked over to level and ſmooth the ſurface: the ſand that is fitting for this purpoſe ſhould be ſuch as will bind, otherwiſe it will be very troubleſome to walk on them in dry weather; for if the ſand be of a looſe nature, it will be moved by ſtrong gales of wind, and in dry weather will ſlide from under the feet; and if it is too much inclinable to loam, it will alſo be attended with as ill conſequence as that which is too looſe, for this will ſtick to the feet after every rain; ſo that where ſand can be obtained of a middle nature, it ſhould always be preferred.

Graſs walks in gardens were formerly held in great eſteem, and were looked upon as neceſſary ornaments to a garden; but of late years they have been much leſs regarded; for theſe long narrow ſlips of graſs are far from being pleaſing to the eye, and are for the greateſt part of the year uſeleſs, being generally too damp for perſons of tender conſtitutions to walk on; and whenever they were conſtantly uſed, they became bare in the places frequently trodden, ſo were rendered more unſightly; and as the intention of walks in gardens is to have at all ſeaſons a dry communication through them for exerciſe and recreation, graſs walks were very improper, becauſe every ſhower of rain made them ſo wet, as not to be fit for uſe for a conſiderable time, and the dews rendered them too damp to walk on either in the morning or evening, and if they are not kept conſtantly cloſe mowed, then they become not only unhealthful but troubleſome to the feet; beſides, whenever the ground is ſo dry, as that perſons may with ſafety walk upon graſs, the lawns and other parts of verdure in gardens are better adapted for uſe than any of theſe formal ſtiff walks, which were ſo much eſteemed in the laſt age.

WALK, among horſemen, is the ſloweſt, and leaſt raiſed of all a horſe's goings. It is performed by a horſe's lifting up his two legs on a ſide, the one after the other, beginning with the hind leg firſt. Thus, if he leads with the legs of the right ſide, then the firſt foot he lifts is the far hind-foot, and in the time he is ſetting it down, (which in a ſtep is always ſhort of the tread of his fore-foot on the ſame ſide) he lifts his far fore-foot, and ſets it down before his near fore-foot. Again, juſt as he is ſetting down his far fore-foot, he lifts up his near hind-foot, and ſets it down again juſt ſhort of his near fore-foot; and juſt as he is ſetting it down, he lifts his near fore-foot, and ſets it down beyond his far fore-foot.

WALL, the principal part of a building, as ferving both to inclofe it, and fupport the roof, floors, &c.

Walls are diftinguifhed into various kinds, from the matter whereof they confift, as plaftered or mud-walls, brick-walls, ftone-walls, flint, or boulder walls, and boarded walls. In all which thefe general rules are to be regarded. 1. That the right angle therein depending is the true caufe of all ftability, both in artificial and natural pofition. 2. That the maffieft and heavieft materials be the loweft, as fitter to bear than to be borne. 3. That the walls, as they rife, diminifh proportionably in thicknefs, for eafe both of weight and expence. 4. That certain courfes or ledges, of more ftrength than the reft, be interlaid, like bones, to ftrengthen the whole fabrick.

Brick-walls are the moft important and ufual amongft us. In thefe, particular care is to be taken about laying of the bricks; that in fummer they be laid as wet, and in winter as dry, as poffible, to make them bind the better with the mortar: that in fummer, as faft as they are laid, they be covered up, to prevent the mortar, &c. from drying too faft: that in winter they be covered well to protect them from rain, fnow, and froft, which are all enemies to mortar: that they be laid joint on joint in the middle of the walls as feldom as may be: but that good bond be made there as well as on the outfide. Care is to be taken that the angles be firmly bound, which are the nerves of the whole edifice. In order to which, in working up the walls of a building, it is not adviseable to raife any wall above eight feet high, before the next adjoining wall be brought up to it, that fo good bond may be made in the progrefs of the work; it may be worth notice, that a wall a brick and a half thick, with the joint, will be in thicknefs fourteen inches, or very near; whence one hundred and fifty or one hundred and fixty bricks will lay a yard fquare meafured upon the face of the building; and to the fquare of ten feet are ufually allowed feventeen hundred or eighteen hundred bricks. Flint, or boulder walls, are much ufed in fome parts of Suffex and Kent, for fence-walls, round courts, gardens, &c. A right and left-handed man fits well for this work, as they have a hod of mortar poured down upon the work, which they part between them, each fpreading it towards himfelf, and fo they lay in the flints. The mortar for this work muft be very ftiff.

Of all materials for building walls for fruit-trees, brick is the beft; it being not only the handfomeft, but the warmeft and kindeft for the ripening of fruit; and affording the beft conveniency for nailing, as fmaller nails will ferve in brick than will in ftone walls, where the joints are larger; and if the walls are coped with free-ftone, and ftone pilafters or columns at proper diftances, to feparate the trees, and break off the force of the winds, they are very beautiful, and the moft profitable walls of any others.

In fome parts of England there are walls built both of brick and ftone, which are found very commodious. The bricks of fome places are not of themfelves fubftantial enough for walls; and therefore fome perfons, that they might have walls both fubftantial and wholefome, have built thefe double, the outfide being of ftone, and the infide of brick: but there muft be great care taken to bind the bricks well in the ftone, otherwife they are very apt to feparate one from the other, efpecially when froft comes after much wet.

There have been feveral trials made of walls built in different forms; fome of them having been built femicircular; others in angles of various fizes; and projecting more towards the north, to fcreen off the cold winds: but there has not as yet been any method which has fucceeded near fo well as that of making the walls ftrait, and building them upright. Where perfons are willing to be at the expence, in the building of their walls fubftantial, they will find it anfwer much better than thofe which are flightly built, not only in duration, but in warmth: therefore a wall two bricks thick, will be found to anfwer better than one of a brick and a half: and if in building of garden-walls they are grouted with foft mortar, to fill and clofe all the joints, the walls will be much ftronger, and the air will not fo eafily penetrate, as it does through thofe which are commonly built.

If the walls are built on arches, and the trees planted at thofe arched places, the trees will be thereby enabled to extend their roots underneath the wall, and be greatly benefited, and forwarded in their growth.

It has been hitherto an almoft unvaried practice, to plant all the finer fruits againft walls, without fufficiently inquiring into the motives for fo doing. But it fhould be obferved in the firft place, that the borders under the walls are feldom made fo wide as they ought to be, confidering that the trees which are planted there can extend their roots but one way: and fecondly, that due care is not taken to adapt the quality of the foil there to the nature of the trees; a precaution which ought to be attended to by thofe who are curious in their fruit, and which would coft only the trifling expence of bringing in a fufficient depth of proper earth.

The chief reafon affigned for planting trees againft walls is, the additional heat procured by the reflected rays of the fun, and the warmth communicated to the wall itfelf by the fun. This, fay the advocates for this practice, haftens the ripening of the fruit, and exalts its flavour; befides, that the fhelter of the walls protects trees, natives of warmer climates, from our fevere north and north-eaft winds.

To this it may be anfwered, that it is a conftant obfervation, that all plants brought from a warmer climate to a colder, endeavour to bloom at their ufual feafon, unlefs they are prevented by cold. The confequence of this is, that if the early part of the fpring happens to be warm, the bloffoms of fuch trees fwell, and expand themfelves: but as we cannot be exempted from froft fo foon in the feafon, thefe bloffoms are nipped in the bud; that is, the firft frofty night ftops the circulation in them, and they then neceffarily die. Nothing fhews more inconteftibly the ftoppages of the circulation in trees, than tapping, for inftance, a birch tree, early in the fpring: for the warmth, or coldnefs, of the air at that time may be determined by the greater or lefs velocity with which the juice flows, or by the greater or lefs quantity of it, that is difcharged, almoft as certainly as by a thermometer. In froft, the difcharge ceafes entirely. It therefore is not at all wonderful, that the circulation is interrupted, by the fame caufe, in the finer veffels of flowers, and that the death of the flower is the neceffary confequence. A very fharp froft, even after the early fruits are fet, has the fame effect on their yet tender veffels; and the owner is furprifed to find his fruit fall off, in a few days after, without any feeming caufe; unlefs recourfe be had to I know not what peftilential quality in the eaft wind, when the fame effect would follow, did the froft come from any other quarter. Hence it is evident, that fruit trees would be benefited, rather than hurt, by preventing their too early bloffoming.

Some gentlemen endeavour to guard againft this accident, by fheltering their trees with fkreens, which have a double effect; that of preferving them from the warmth of the fun by day, and that of defending them from the froft by night. But if thefe trees were planted as ftandards, where the air might play freely round them, the motion of the fap would be lefs forward, and the bloffoms would confequently be lefs expofed to the injuries which happen from their coming out too early. They would likewife efcape another great inconvenience which attends their ftanding againft walls; namely, the two great inequality of the heat, as increafed by the wall, and the coldnefs of the night, againft which the wall affords no fhelter, otherwife than as it fkreens the trees from the wind.

A farther reafon which renders walls the lefs neceffary is, that the fruits planted againft them ripen before the fun has acquired its full force in this climate. This is what happens to all our apricots, to moft of our nectarines, and to the fineft of our peaches: for it is well known, that the month of July is our hotteft feafon, and that the heat of that month will therefore the moft perfectly exalt the juices and flavour of fruit.

Walls may indeed be neceffary for the later peaches: though even a Catherine peach will ripen on a ftandard, in a favourable fituation.

All the ftone fruits are accounted peculiarly proper for walls, and fo are many kinds of pears. Some of the finer forts of thefe laft may indeed do well enough when fo planted: but I cannot by any means think the cherry, for example, a proper tree for a wall, becaufe it will not bear the cutting neceffary to train it in that manner. The late pears and peaches are, in my opinion, the only fruits really fit for this ſort of culture. However, for the ſake of thoſe who chooſe to continue to extend it to other kinds, we ſhall obſerve, that peach trees, and thoſe of nectarines, placed againſt walls, ſhould be ſet about twelve feet aſunder: apricots ſhould be allowed a breadth of ſixteen or eighteen feet; cherries and plums, twenty-five feet; and moſt ſorts of vigorous ſhootings pears, from thirty to forty, according to the goodneſs of the ſoil, and the height of the wall.

The root of the tree taken from the nurſery ſhould be placed in a hole dug about five inches from the wall, and its head ſhould be inclined thereto, with the bud turned outwards, to conceal the wounded part of the ſtock. The hole ſhould then be filled up, ſo as neither to leave chaſms between the roots, nor to preſs the earth down too hard upon them. Some of the twigs of the young tree ſhould then be faſtened to the wall, to prevent the wind's diſplacing it ſo as to break the tender fibres of its roots; the ſurface of the ground ſhould be covered with mulch, to keep out the froſt; and in the following ſpring, about the beginning or middle of March, according as the ſeaſon is earlier or later, the head of the tree ſhould be cut down to four or five eyes above the bud, juſt before it begins to ſhoot. In this cutting off the head, the gardener, to avoid as much as poſſible giving any diſturbance to the roots, ſhould ſet his foot down cloſe to the ſtem of the tree, and take faſt hold of the ſtock, below the bud, with one hand, to keep it ſteady, whilſt, with the other, he ſlopes off the upper part gently, with a ſharp knife, at the intended place, which ſhould always be juſt above an eye. This ſhould be done in dry wather; for if much rain ſhould fall ſoon after, and wet get into the wounded part, the tree will be liable to ſuffer conſiderable damage: and for the ſame reaſon, together with its preventing the cloſing of the wound, froſty weather ſhould alſo be cautiouſly avoided. After the tree has been headed, the earth of the borders ſhould be looſened gently, to render it more fit to admit the fibres of the roots, and if the mulch which was laid on in the autumn be rotten, it may be dug into the border, at ſome diſtance from the roots, with all poſſible care not to diſturb or break them. When the dry weather comes on, a few ſods pared off from a paſture ground, and laid upon the ſurface of the border, about the roots of the trees, with the graſs downward, will preſerve a gentle moiſture in the earth, and be leſs apt to harbour inſects, than any ſort of dung or litter.

The above is the uſual method of tranſplanting trees from the nurſery to a wall. But Mr. Miller is convinced, from experience, that, inſtead of taking from the nurſery ſtocks (eſpecially of peaches and nectarines) which have then made one year's ſhoots from the bud, it is better to ſingle out ſuch as were budded the preceding ſummer, and have not made any ſhoot; provided the bud be ſound and plump, and the bark of the ſtock well cloſed at the place of budding; becauſe, when this ſhall have put forth a ſhoot five or ſix inches long, in the following ſpring after being tranſplanted, as it will ſeldom fail to do, that ſhoot may be ſtopped by pinching off its top, and thereby be made to produce lateral ſhoots, which may be trained to the wall, without having any head to cut off, as muſt be done to thoſe trees which have had one year's growth in the nurſery. The benefit of avoiding this operation is particularly great to ſuch trees as are apt to bleed much, and ſingularly ſo to the moſt tender ſorts. The ſtock of the tree tranſplanted in bud, before it has made any ſhoots, muſt indeed be cut down, likewiſe in the ſpring, to juſt above the bud, becauſe this will rarely ſhoot unleſs that be done; and the nearer it is cut to the bud, the ſooner will the head of the ſtock be covered by the bud: for there is no occaſion to leave on trees which are planted againſt a wall, a part of the ſtock, above the bud, to faſten the ſhoots to, as muſt be done with thoſe in the nurſery; becauſe the ſhoots may here be immediately and properly ſecured, by faſtening them to the wall: nor is this cutting off the ſuperfluous part of the ſtock attended with any danger to the bud, if the wound be but covered with a little grafting wax, or clay, to keep out the wet.

No time is loſt, but ſome may be gained, by this practice; as the trees which have ſhot before their being tranſplanted muſt be cut down, and there is a hazard of their ſhooting again.

In watering of theſe new planted trees, which ſhould not be done unleſs the ſpring prove very dry, nor then often, or in great quantity, the pot ſhould have its noſſel on, ſo as to let the water out very gently, almoſt in drops only, as it were; for when it is poured down haſtily, it hardens the ground: and if the head of the tree is watered at the ſame time as its roots, and likewiſe gently, that refreſhing will be of great ſervice to it.

About the middle of May, the ſhoots of theſe trees, of which there will then often be ſeveral ſix or eight inches long, ſhould be nailed horizontally to the wall. All fore-right ſhoots, and ſuch as are weak, ſhould alſo then be rubbed off, to ſtrengthen thoſe that are left. But if no more than two ſhoots have been produced, and thoſe very ſtrong, the tops of theſe ſhould be nipped off at that time; and this will make each of them put out two or more ſhoots, whereby the wall will be the better furniſhed with branches. It will alſo be right to continue to refreſh them gently with water, from time to time, during the whole ſummer, if that ſeaſon ſhould be very dry, leſt their roots, having but little hold of the ground the firſt year after tranſplanting, ſhould be injured by the drought, ſo as to retard the growth of the tree.

In the beginning of October when the trees have done ſhooting, it will be time to begin to prune them. In doing this, the branches muſt be ſhortened in proportion to the ſtrength of the tree; that is, if it be ſtrong, they may be left eight inches long; but if weak, they ſhould be ſhortened to four or five. The ſhoots thus cut ſhould then be trained horizontally to the wall, ſo as to leave the middle of the tree void of branches, for that part will be eaſily furniſhed with wood afterwards; whereas, if the ſhoots are trained perpendicularly to the wall, the ſtrongeſt will draw away the greateſt ſhare of the ſap from the roots, run upwards, and leave the ſide branches ſo deſtitute of nouriſhment, as frequently to occaſion their decaying and dying.

In the next ſummer, when the trees begin to ſhoot, they ſhould be carefully looked over again; all fore-right or ill placed buds or ſhoots ſhould be rubbed off, and ſuch as are to remain, for future branches, ſhould be trained up horizontally to the wall, in due order, as they are produced; for this is the principal ſeaſon in which all fruit trees are beſt and moſt effectually modelled to their intended form. Every gentleman who wiſhes his trees to proſper to the utmoſt, and to grow with as much beauty as they are ſuſceptible of, ſhould therefore perſonally look over them at this time, and, with his own hand, rub off their ſuperfluous buds and ſhoots: for if this elegant and eſſentially uſeful part of gardening is left to the hired gardener, it will often be neglected, or ſlovenly performed. Whoſoever omits it, deſerves not to have good fruit. This important buſineſs ſhould not be deferred till Midſummer, as is the common practice, becauſe numbers of uſeleſs ſhoots, which muſt afterwards be cut off, will by that time have robbed the other parts of their due nouriſhment: and beſides, it is by ſtopping ſome of the ſtronger ſhoots (by nipping off their tops) in May, that they are made to put out ſide ſhoots, which, being guided to the vacant parts of the wall, furniſh every part thereof regularly with proper wood. Care muſt, however, be taken not to multiply theſe branches too much, for fear of weakening the tree ſo as to diſable it for producing good fruit; and therefore no ſhoots ſhould be ſtopped in the ſummer, unleſs there be an abſolute neceſſity for new branches in any particular place. Neither ſhould the branches be laid in too cloſe together againſt the wall, becauſe the great numbers of their leaves then exclude the air from their ſhoots, ſo that theſe are never duly ripened, and the fruit which is afterwards produced on them cannot, conſequently, be ſo well taſted as that of trees whoſe ſhoots receive all the advantages of the ſun and air, to bring them to maturity.

In the third year, the branches till then trained horizontally will have acquired ſuch ſtrength, that there will not be much danger in permitting ſome of their ſhoots to go in a more perpendicular direction, in order gradually to give the whole tree the form of a fan, which is by much the moſt beautiful, as well as the beſt way here, because the wall is thereby most equally filled with wood.

It is in continuing strictly to observe the two foregoing rules, viz. to furnish every part of the tree as equally as possible with bearing wood, and not to lay the branches in too close together, that the art of pruning fruit trees in general, and particularly wall trees, chiefly consists. The former of these will always be completely effected by pinching off the tops of the young shoots, wherever an increase of wood is wanted, in May, as above directed. But as some have advised the doing of this in June, and others even later, we must remark here, that if we reflect that young shoots made so late in the year have not time to acquire a sufficient strength and solidity of fibres to resist the winter's frost, May will certainly be found to be a much more proper season: for whoever casts an attentive eye over fruit trees after a hard winter, will find many of their shoots killed by the preceding frost; and if he looks still more closely, he will see, that most, if not all, of these have been injudiciously forced out in a too late season. It is almost needless to say that April, which others again recommend for this work, is too early; because the wounded branch would then be in danger of being destroyed by a frosty night. If these directions are judiciously followed, it will not be necessary to touch any fruit tree with a knife in the summer: and that the avoiding of this will be of infinite service to every species of them, is manifest from the many accidents to which they are liable when cut too much at that season. All the soft, tender, and pithy wooded sorts, such especially as the peach tree, require a considerable time to heal their wounds, when these are great, and in the mean while wet and rain easily soak into the wounded parts, so as frequently to make the branches canker and die.

As to the distance at which the branches of fruit trees, or rather the shoots of those branches, should be trained against a wall; nature gives us a sure guide, if we but attend to the size of the fruit and of the leaves: for it should be such that neither of these upon an upper branch may touch the branch underneath.

The winter pruning, as it is called, of fruit trees is commonly performed in February or March: but the best season for it is in October, when their leaves begin to fall; for that will be early enough for their wounds to heal before the frost comes on, so that there will be no danger of their being hurt thereby. Thus all the ascending sap in the spring will be employed to nourish only those useful parts of the branches which are left; whereas, if they are not pruned till February, the greatest part of the sap then in motion in the branches, as may be observed by the swelling of the buds, will be drawn up to the extreme parts of the branches, to nourish blossoms which must afterwards be cut off: for the extreme buds of strong shoots always swell sooner than most of the lower ones, and constantly draw from those below.

It is the constant practice of gardeners, founded upon long experience, to prune weak trees early in the winter, that they may be the less endangered by the cutting, and luxuriant trees late in the spring, in order to check their luxuriancy.

WALL-FLOWER, a species of yellow flower, so called from its growing naturally on old walls.

All sorts of wall-flowers, except the double ones, are raised from seeds, either by sowing when the seeds are ripe, or in the spring; those which produce double flowers are raised from slips, which should be planted in a shady situation, either in April or May, which, when sufficiently rooted, may be transplanted where they are intended to blow; these flowers appear in the spring, and are much admired for their fragrancy.

WALLNUT-TREE, the name of a well known tree formerly held in great esteem in this country, for its wood, which is, in fact, often very finely veined; but, on account of its aptness to be worm-eaten, it has of late given place to the beautiful and much sounder mahogany, with which our cabinet-makers have been pretty plentifully supplied from the British settlements in the West Indies.

As an useful fruit tree, independent of its timber, which is, however, still of good value, it merits the husbandman's attention; nor can the gentleman easily find a more stately one to adorn his park with, or to form a noble avenue to his mansion.

These trees are raised from their nuts, which it is best to keep in dry sand, with their outer covers on, till February; that being the right time for planting them. If they are intended for timber trees, they should be sown in the places where they are to remain, in order that the breaking or otherwise shortening of their roots, and especially those of the tap kind, may not stint their growth, and make them run out in branches: but if they are designed for fruit, their fertility will be increased by transplanting them, because their downright roots, which are those that chiefly encourage the luxuriant growth of wood in all sorts of trees, will be thereby checked, and they will be made, in lieu of them, to strike out numbers of lateral roots, which, as experience has proved, always conduce greatly to the production of the largest and fairest fruit. The most proper season for transplanting them is when their leaves begin to decay; and the best age, when they have had three or four years growth in the nursery. Mr. Miller says he has frequently experienced that there is little danger of their succeeding although they be eight or ten years old when they are transplanted: but, however that may be, it is certain that they will root best, grow largest, and last longest, if they are removed young. The less their branches are cut at the time of transplanting, or indeed at any time after, the better they will prosper; for much lopping often causes them to decay: but if there be a necessity for taking off any of their boughs, it should be done early in September, that the wound may have time to heal before the cold and wet comes on. It is likewise essential to cut the branch off quite close to the trunk, lest the stump which is left should decay, and rot the body of the tree; to prevent which, especially if the wound be large, it will be right to smooth it well with a chissel, and then to cover it over carefully with a cement of clay or wax, as in the case of grafting, with a piece of tarpawling, or of sheet lead, over that.

These trees should not be planted nearer together than forty feet, and more may be yet better, if they are designed for fruit. They delight in a firm, rich, loamy soil, or such as is inclinable to chalk or marl; and they will thrive very well in stony ground, or on chalky hills, as is evident from those large plantations near Leatherhead, Godstone, and Carshalton in Surry, where great numbers of these trees planted upon the downs produce annually large quantities of fruit, to the no small advantage of their owners.

In order to preserve this fruit, it should be left upon the tree till it is thoroughly ripe, and then, as it would be exceedingly troublesome to gather it by hand, it may be beaten off, but not with such violence as is commonly used, from a mistaken notion that the tree is improved thereby: for most certainly it cannot be benefited by that rough way of forcing off the young wood upon which this fruit grows. The nuts thus obtained should be laid in heaps for two or three days, after which they should be spread out, and when they have parted from their husks, which they will then soon do, and have afterwards been well dried in the sun, to remove the moisture of their shells, which would otherwise make them mould, they should be laid up in a dry place, where neither mice nor other vermin can get at them. In this manner they will remain good for four or five months: or, which is a yet better way, and will keep them still longer, let them, when their outward moisture has been dried by the sun, be put up in jars, or other close vessels, with dry sand between their interstices. The laying of them for four or five hours in an oven gently heated, as is the practice of some, will indeed dry the germ, and prevent their sprouting: but if the oven is too hot, it will make the kernels shrink, and prevent their being peeled with any tolerable ease.

Were it only for the oil that these nuts afford, the trees which produce them would be worth some care. Mr. Evelyn says that one bushel of them will yield fifteen pounds of peeled kernels, and that these will yield half that weight of oil, which the sooner it is drawn, is the more in quantity, though the drier the nut, the better in quality. He adds, that the lee, or marc of the pressing, is excellent to fatten hogs with. Certainly it would be good manure for land; as are the cakes of lin-feed, rape, &c. after the oil has been squeezed out of them. The green husks boiled, without any mixture, make a good colour to dye a dark yellow. The kernel being rubbed upon any crack or chink of a leaking vessel, stops it better than either clay, pitch, or wax.

The French are very fond of the kernels of these nuts scooped out of the shells before they are hardened, with a short broad brass knife; because iron rusts and communicates a disagreeable taste to the kernels. When scooped out, they are steeped in salt and water for a few hours before they are set upon the table, as well to take off all taste of bitterness, as to make them peel with the utmost ease.

WANG-TOOTH, a jaw tooth.

WANT, a mole. *See the article* MOLE.

WANTY, a broad girth of leather, by which the load is bound upon a horse.

WAPENTAKE, the same with what is commonly called a hundred, and generally used in the northern counties beyond the Trent.

WARBLES, small hard tumours on the saddle part of a horse's back, occasioned by the heat of the saddle in travelling, or its uneasy situation.

A hot, greasy dish-clout at first frequently applied, will sometimes remove them. Camphorated spirits of wine are also very effectual for this purpose to disperse them, especially if a little spirit of sal ammoniac be added to the camphorated spirit. If there be a necessity for working the horse, care should be taken to have the saddle nicely chambered.

WARP, miscarry, slink her calf.

WARREN, a franchise, or place privileged, either by prescription or grant from the king, to keep beasts and fowl of warren in; as rabbits, hares, partridges, pheasants, &c.

By statute 21 Edw. III. a warren may lie open, and there is no need of closing it in, as there is a park.

In the setting up a warren, great caution is to be used for the fixing upon a proper place, and a right situation. It should always be upon a small ascent, and exposed to the east or the south. The soil that is most suitable, is that which is sandy; for when the soil is clayey or tough, the rabbits find greater difficulty in making their burrows, and never do it so well; and if the soil be boggy or moorish, there would be very little advantage from the warren, for wet is very destructive of these animals.

All due precautions must be taken, that the warren be so contrived, that the rabbits may habituate themselves to it with ease. Many would have it, that warrens should be enclosed with walls; but this is a very expensive method, and seems not necessary nor adviseable; for we find but very few that are so, and those do not succeed at all the better for it.

The dung of rabbits is a great fertilizer of useless lands, and Mr. Mortimer tells us that he has known vast crops of rye upon barren lands that have been old warrens well dunged by rabbits; and large oak and ash upon the same, though the soil was very shallow.

WASTE, a name given to such lands as are in no man's possession, but lie common.

WATER, a simple, fluid, and liquid body, reputed the third of the four vulgar elements. Sir Isaac Newton defines water to be a fluid salt, volatile and void of taste: but this definition Boerhaave sets aside, inasmuch as water is a menstruum or dissolvent of salts and saline bodies, which does not agree with the notion of its being a salt itself; for we do not know of any salt that dissolves another. This last-mentioned philosopher, therefore, defines water, a very fluid, scentless, tasteless, transparent, colourless liquor, which turns to ice with a certain degree of cold.

Though water be defined a fluid, it is a point controverted among philosophers, whether fluidity be its natural state, or the effect of violence. We sometimes find it appear in a fluid, and sometimes in a solid form; and as the former, in our warmer climate, is the more usual, we conclude it the proper one, and ascribe the other to the extraneous action of cold.

Boerhaave, however, asserts the contrary, and maintains water to be naturally of the crystalline kind; since, wherever a certain degree of fire is wanting to keep it in fusion, it readily grows into a hard glebe, under the denomination of ice. Mr. Boyle is of the same opinion. Ice, he observes, is usually said to be water brought into a preternatural state by cold; but with regard to the nature of things, and setting aside our arbitrary ideas, it might as justly be said, that water is ice preternaturally thawed by heat.

If it be urged, that ice, left to itself, will, upon the removal of the freezing agents, return to water; it may be answered, that (not to mention the snow and ice which lie all summer on the Alps, and other high mountains, even in the torrid zone) we have been assured, that in some parts of Siberia, the surface of the ground continues more months in the year frozen by the natural temperature of the climate, than thawed by the heat of the sun; and a little below the surface of the ground, the water which chances to be lodged in the cavities there, continues in a state of ice all the year round; so that when, in the heat of the summer, the fields are covered with corn, if you dig a foot or two deep, you shall find ice and a frozen soil.

Water is generally divided into salt and fresh, with regard to the ocean and rivers. But, according to Dr. Shaw, it seems divisible into as many different species, as the earth is into beds. Thus there are mineral waters of various kinds, according to the mineral substance they run over, and become impregnated with; though this impregnation sometimes happens in the way of vapour and exhalation. Water, therefore, in general, may be as mixed a body as earth, and perhaps neither of them naturally exists in any considerable purity.

In a general analysis of water, the doctor found, 1. That common warm water throws up numerous little bubbles, and explodes, in the exhausted receiver of the air-pump; for which reason, water contains what may, by way of distinction, be called æther or spirit.

2. It contains a merely aqueous part, distinct from æther and the sediment, as appears from distilled common water.

3. It contains a dry solid matter, which is either earthy or saline, as appears upon a full evaporation, and from the insides of tea-kettles, which, after long use, are lined with a stony matter, that beats off in flakes or crusty pieces.

Water is not only contained in the earth as in a reservoir, but likewise floats in the atmosphere. In both cases, it is actuated, rarified, and put in motion by heat, so as to prove instrumental in producing effects. Thus it produces clouds, rains, dews, springs, and rivers. It refreshes the earth, recruits vegetables, and is the support of fish and other animals by conveying nutriment to all their parts. It is also the first and immediate instrument of fermentation, putrefaction, corruption, and change in all vegetable and animal subjects.

But the nature and uses of water, will best appear from the following experiments:

1. That water is contained in many solid bodies, and to appearance in dry bodies, was proved thus: a piece of the hardest and driest bone being procured, and distilled in an earthen retort, with degrees of fire, a very large proportion of water, along with much oil and volatile salt, was obtained: whence it appears, that animal matters are resolvable into the four chemical principles, water, oil, salt, and earth. This experiment holds true even of the oldest hartshorn, the driest and hardest woods, earths, and pulverized stones.

Whence it also appears, that water may be concealed in solid bodies, and make a constituent part thereof: for it is not meant that water insinuates itself into the superficial pores of bodies, such as wood, skins, &c. so as to swell them in moist weather, and leave them shrunk in dry; but that it remains permanently intermixed as an essential ingredient, or as a part of solid bodies. *See* BODY.

2. That water may be collected from the driest air, or in the hottest climate, was proved by the following experiment:

Half a pint of common water was put into a cylindrical glass, wiped perfectly dry on the outside; then was added to the water, two ounces and three quarters of pulverized and feems rational: for the water then, not only fupplies the moifture wanted in the earth, but it diffolves every fubftance foluble in water, and thereby converts to an additional manure, what might otherwife have remained long in its original ftate. Care fhould, however, be taken, to drain off the water before the feafon of ftrong frofts is expected; becaufe froft is obferved to deftroy all kinds of vegetables much more when the plants are full of fap, than when they are in a dryer ftate. We may eafily comprehend that it muft have this effect, when we confider with what force it breaks every veffel containing water expofed fo as to be frozen: for froft dilates all fluids to fuch a degree, that the veffels in which they are muft be broken thereby. Hence it is that fucculent plants foon become a putrid mafs after a hard froft: and thus it is that the ftrongeft trees are fometimes burft with a loud report.

When the water is brought to the defired height, the main channel fhould be cut, with fuch a defcent as only juft to keep the water in a gentle motion. That channel fhould be made in the higheft part of the pafture, and proportioned to the quantity of water neceffary to be introduced. If a hollow intervenes between the place at which the water is brought into the field, and another rifing ground in that field; it will be worth the farmer's while to convey it a-crofs that hollow, by pipes made of wood, or any other fubftance, laid either horizontally over that hollow, or underneath it. The motion of the water in this horizontal channel fhould be different, according to the quality of the ground. If it is a ftrong earth, the channel may be cut nearly horizontally: but if it is a light loofe foil, a quicker current fhould be given to the water, in proportion to the degree of lightnefs of the earth; or great part of the water will otherwife be loft, by finking into it. In a light foil of this kind, it may be proper to line this main channel with brick or ftone, well cemented with lime, to hinder the water from efcaping through the crevices; or at leaft to cover it with clay well rammed. As to the degree of defcent moft proper for the main channel, in order to give a current to the water, M. Bertrand, to whom we owe one of the ingenious differtations on this fubject in the memoirs of the Berne Society, obferves, that Vitruvius required fix inches in an hundred feet, which is a great deal too much: but that the moderns, who have made the moft exact experiments in this refpect, are fatisfied with two inches in fix hundred feet, when they cannot have more, and recommend particularly the avoiding of all fharp angles in the winding of the channel, and the making of its bottom quite fmooth and even. He adds, that this is nearly the declivity of the aqueduct of Rocquancourt, by which the water is conveyed to Verfailles; the diftance there being three thoufand four hundred yards, and the flope, in all, only three feet.

The main channel fhould be of breadth, rather than depth, fufficient to receive all the water that is intended to be conveyed through it, and that breadth fhould leffen gradually as the water is carried off in leffer channels, in order that the water may prefs into thofe fmaller ducts, which are to iffue all along from the chief. The leffer channels fhould be as fhallow, and as numerous, as can be: for the more equally the water is diftributed over the grafs, the greater will be the improvement. They fhould be made particularly wherever the water collects itfelf into a ftream: for though cutting fo much turf may feem to wafte a great deal of land, yet it proves not fo in the end; becaufe the quicker the water runs over the grafs, the more it benefits the pafture.

To keep the channels in repair, they fhould be frequently cleaned, efpecially after every cutting of the hay. The flime then taken out of them fhould be fpread upon the pafture, and the next growth of the grafs will be greatly improved thereby. Care fhould alfo be taken to have drains to carry off the water, fo that none of it may ftagnate upon the land.

The beft way of watering a flat meadow, which is ufually furrounded with a ditch, is to ftop the out-let of the ditch, and, by bringing in a quantity of water, to overflow the whole meadow, for fuch time as fhall be judged neceffary to moiften the earth fufficiently: but the water fhould not be continued upon it fo long as to wither the grafs. If this can be done in a rainy feafon, it will be fo much the better; becaufe the water will then be loaded with the enriching mud and flime wafhed down from the higher grounds.

The firft heavy rains which fall in the latter end of the autumn, and which carry with them the rich particles of putrified animals and plants, are thought to be more fertilizing than at any other feafon of the year, and are therefore brought into the pafture, as often as the abfence of the cattle fed on them will permit.

The next beft to rain, is clear and fweet fpring water, flowing from a copious fource. Here it is generally objected, that fpring water is hard, and therefore not fit for the nourifhment of plants. But Dr. Home, who judges otherwife, expreffes himfelf thus on this very occafion. "Is not hard water more nourifhing for vegetables than foft water? I imagine that the falt of vegetables enters their veffels in fuch a form as hath the falt which is found in hard waters. The falt of hard waters feems likewife to be of the nitrous kind, of which the nourifhment of plants is alfo fuppofed to be. This query thwarts the general opinion; for no gardener will make ufe of hard water, if he can avoid it. I watered fome plants with it, and thought that they grew better than thofe which were watered with foft water."

This is confirmed by an ingenious correfpondent of the Berne Society, who made feveral experiments on the qualities of different waters, and found that their greater or lefs hardnefs made very little difference in their effects, when ufed for watering of paftures. The water of an excellent fpring, which, upon trial, was found to be hard, fertilized greatly the pafture upon which it was let in.

Spring water may be ufed later in the winter, than any other, becaufe, being warm, a mild froft will not freeze it, even when expanded on the pafture. It fhould however be turned off foon enough to let the earth become a little dry before fevere frofts fet in. It may likewife be ufed earlier in the fpring, than other waters, and to better advantage, by reafon of the warmth which it communicates to the ground where it flows: and it becomes extremely proper in the fummer, becaufe it cools during the night (the only time for watering at that feafon) the heated foil, and grafs fcorched by the power of the fun.

The equal warmth of fpring-water, is what renders it peculiarly ufeful for watering paftures. The laft quoted correfpondent of the Berne Society tried its heat, in Swifferland, on the twenty-fixth of May, when the earth had been very little warmed by the fun, after a long winter's cold. He then found M. de Réaumur's thermometer, placed in the fpring of water, ftand at eight degrees and a half (equal to forty-feven and a half of Farenheit's) above the freezing point. On the fifth of July, in the evening, when the heat of the air was very great, Réaumur's thermometer, again placed in the fpring, ftood at nine degrees and a quarter (equal to forty-nine of Farenheit). He afterwards tried whether the warmth of the fpring was confiderably increafed towards the end of the fummer, when the earth was extremely heated: but even then, Réaumur's thermometer fcarcely reached ten degrees (equal to about fifty of Farenheit's). By this we fee, that fprings which yield a full and conftant ftream vary very little in their degrees of warmth.

For the fame reafon it alfo is, that a perpetual verdure reigns around fuch fprings, even during the hardeft froft; and if their water could be preferved from freezing when fpread over a field during the winter, it would be right to let them in upon paftures in that feafon: but as they foon lofe their heat when difperfed over the grafs, this is by no means advifable.

Experience has taught the inhabitants of the Alps (and the fame will hold equally true in all mountainous countries), that it is not advifable to water paftures with the floods which arife from melted fnow, or with the water of rivers fed thereby. One reafon which feems to render the water that defcends from mountains perpetually covered with fnow the lefs ufeful for watering paftures, is, that as all vegetation is at a ftand in fuch places, no vegetable matter can be mixed with this water; and it therefore cannot communicate the fertility which arifes from waters fraught with thofe rich fubftances.

We are frequently told of correcting the crudity of water, by making it turn a wheel, or putting it otherwife in-

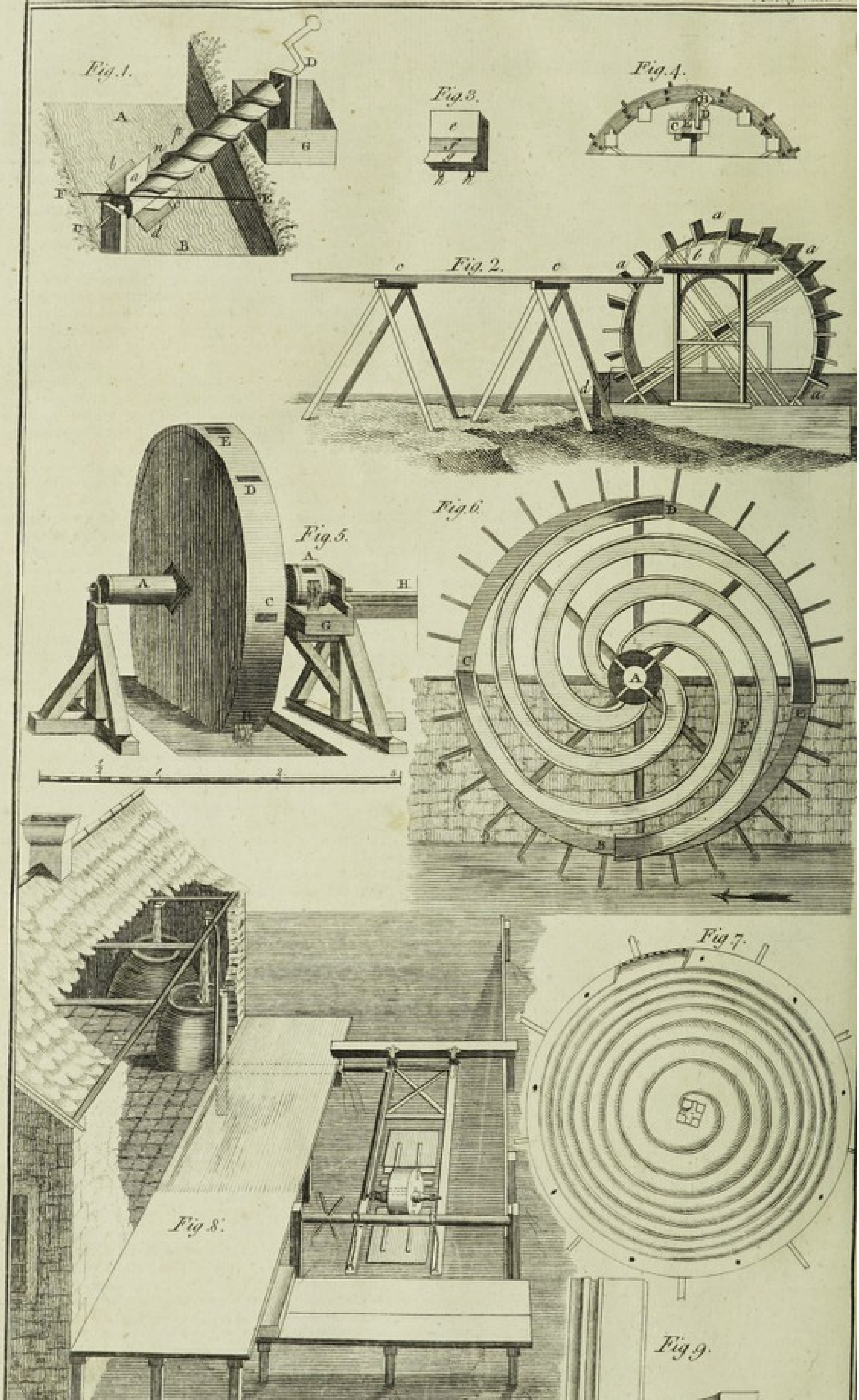
Fig.1.
Fig.2.
Fig.3.
Fig.4.
Fig.5.
Fig.6.
Fig.7.
Fig.8.
Fig.9.

to violent motion: but I know not what good effect this can have.

What are commonly called barren springs, are sometimes corrected by mixing dung with their water in ponds made higher than the pasture intended to be watered. Yet this, though an old custom, is liable to some objections; one of which, in particular, is, that the water will deposit its richness on the first part of the pasture over which it flows, and therefore improve the grass very unequally. But if dung has this effect, it will answer equally well, if it be spread upon the land. Care should, indeed, be taken, that the current of the water be very slow over a pasture newly dunged; because the fertilizing particles of the dung may otherwise be carried off by the stream, before they can have had time to penetrate into the earth.

When dung, marle, or lime, is laid on a pasture which has a considerable descent, the best way is to lay a larger proportion on the higher parts; because the common rain water will wash some of their richer particles down to the lower.

As clayey soils retain water, and by that means chill the plants growing on them, they are the least fit for watering of any. If the water abides on them, they become poachy; and when dried again, they gape, and become so hard that no plant can pierce them. Some sensible farmers have likewise observed, that their clayey lands have always yielded less grass in wet years, than when the season has been dry; which is a manifest proof that a soil of this kind does not admit of watering, unless it be a little, in case its surface is become hard after the hay has been taken off, or when the grass is short. Such lands are fitter for arable, if their situation permits it.

Hazel earth, which is a loam mixed with gravel, and of a clayey nature, is the strongest soil that can be watered with propriety: and that this has been surprizingly benefited thereby, is evident from several instances given in the Memoirs of the Berne Society, even of large tracts of such ground that have been vastly improved by this means: but I shall mention here only the following.

" In the summer of 1758, part of the pasture ground belonging to a farmer in Swisserland was so entirely covered with stones and gravel, by the sudden overflowing of a stream, that it looked like a bank of sand. As the removing of this quantity of stones and gravel would have cost a great deal of labour and expence, the owner of the land carried off only the largest stones, and threw over the gravel a reddish earth taken from a neighbouring hill; but so thinly spread, as only to fill the interstices between the pebbles, without entirely covering them. He then sowed this spot with hay seeds, and let in upon it the waters of an adjacent spring and a neighbouring rivulet. These waters were let in sparingly at first, till the grass began to appear, and after that they were flowed more abundantly. The consequence of this prudent conduct was, that the grass thus raised bore cutting once the first year, and after having been moved twice in the second, promised an excellent after-math at the time when this account was written, which was in the beginning of the autumn of that second year. The very first year's crop grew so prodigiously, that the grass was lodged, even though the pebbles were then felt under foot, if one trod upon it." *See the article* MEADOW.

When the land is above the level of the adjacent water, recourse must be had to some engine to raise it to a proper height, in order to overflow it; though this will be attended with a very considerable expence, especially at first.

The oldest instrument used for this purpose is known by the name of Archimedes's water screw, and is thus described by Mr. Emerson.

C *p* D (Plate XXVII. Fig. 1.) is a cylinder which turns upon the axis C D. About this cylinder there is twisted a pipe, or rather several pipes, *m*, *pq*, running spiral wise from end to end. This cylinder is placed higher at one end, D, than at the other; and its use is to screw up the water from the lower end to the higher. A B is a river running in the direction A B. *a*, *b*, *c*, *d*, are several floats fixed to the cylinder. E F is the surface of the water. As the cylinder stands in an inclined position, the upper floats *a*, *b*, are set out of the water, and the under ones *c d* within it: so that the water acts only upon the under ones *c*, *d*, and turn about the cylinder in the order *a*, *b*, *c*, *d*. By this motion, the water taken into the spiral tubes at the low end is, by the revolution of the cylinder, conveyed through these pipes, and discharged at the top into the vessel G. If A B is a standing water, there is no occasion for the floats *a b c d*; and then the cylinder is to be turned by the handle at D. Instead of the pipe, a spiral channel may be cut round the cylinder, and covered close with plates of lead. The closer these spiral tubes are, the more water is raised: but it requires more force. Also the more the cylinder leans, the more water it carries; but to a less height.

Where a considerable quantity of water is to be raised, a greater force is requisite, than can be applied to such a handle. Her royal highness the princess dowager of Wales has caused an instrument of this kind to be erected at Kew, by the ingenious Mr. Smeaton, and by means thereof a sufficient quantity of water is supplied, for all the ponds, and other uses, in that elegant and extensive garden: but it is there worked by horses.

The most common engine for raising water is the Persian wheel, of which Mr. Worlidge gives the following description.

" This wheel is made much after the manner of that of an under-shot mill, viz. with a double ring, into which are let two pins, on which the floats are fastened. These floats are made hollow; the half that is the most remote from the wheel, holds the water which is taken in at the open place, above the middle of the back of the float, and as the wheel goes round, and the float laden with water rises, so the water, by degrees, tends towards that part of the float which is next the wheel, and as the float surmounts the cistern or receiver, the water empties itself into it, every float succeeding the one the other, emptying itself into the receiver: so that if one float contain a gallon of water, and there be thirty floats on the wheel, at one motion round it delivers thirty gallons of water into the cistern. Such a wheel will be about fifteen foot diameter, the floats at eighteen inches distance, and will deliver the water at eleven or twelve foot above the level of your stream, and will go four times round in one minute, and carry up about one hundred and twenty hogsheads of water in an hour, with twelve or eighteen inches penning or stopping of but an ordinary current of water which will water very well thirty or forty acres of land: for if your land be cold and clayey, too much water does it hurt; and if it be light, warm, or sandy, a little water does it much good. It is also to be observed, that this motion is constant, and will last many years without repair, so that it stand not still, for one side to dry and wax lighter than the other: also observe, that the slower it moves, the better it delivers the water.

" The view of this wheel we have in Plate XXVII. Fig. 2. *aaaa* signify the wheel; *b*, the cistern that receives the water; *cc*, the trough standing on tressels, that conveys the water from the cistern to the place you desire; *d*, the hatch, or pen-stock that bays up the water to a reasonable height, under which the water drives the wheel; *e* (Fig. 3) one of the floats presented open to your eye, apart from the wheel; *f*, the place that is to receive the water; *g*, the open place out of which the water issues; *hh*, the two pins or ledges riveted on to the foreside of the float, and wherewith you are to fix the float to the two rings of the wheel. These, or such like wheels, are much used in Spain, Italy, and France, and are esteemed the most easy and advantageous way of raising water in great quantity, to any height within the diameter of the wheel, where there is any current of water, to continue it in motion, which a small stream will do.

" How many acres of land lie on the declining sides of hills, by the sides of rivers, in many places where the water cannot be brought unto it by any ordinary way? yet by this wheel placed in the river, may the land be continually watered, so far as is under the level of the water when raised."

Instead of raising the water by means of the hollow floats placed around the outer circumference of the rim of the wheel, as here described; M. Belidor proposes, for wheels of kind, to raise it in buckets placed at equal distances upon the side of the rim of the wheel, and suspended by a pin, upon which they play, as at A Fig. 4. When, by by the rotation of the wheel, one of these buckets comes to B, which is the summit of the wheel, the upright piece D, which is fastened to the side of the trough C, turns that bucket upon its side, and thereby makes it empty itself into the trough C, from whence the water is discharged into a receiver at E. — As these buckets keep full of water till they are carried up to the top of the wheel, where they are turned over, a much greater quantity of water may, undoubtedly, be raised by them, than can be by the floats of the Persian wheel, from which much must be spilled as it is carrying up. The size of these buckets should be adapted to the force of the current of the water which they are to take up.

Another wheel for raising water, though not to so great a height, is represented in Fig. 4. This engine was first invented by M. de la Faye of the Royal Academy of Sciences at Paris, and is now used with great success by the honourable Mr. Hamilton, at his seat at Pain's-hill in Surry, where that gentleman has shewn how far a barren spot may not only be rendered useful but even an ornament to the adjacent country.

This machine consists of a wheel whose size is adapted to the height to which it is intended to rise the water. A perspective view of this machine is represented Fig. 5. and its internal parts Fig. 6. The wheel turns upon its axis at A, and has several curved pipes, B, C, D, E, fixed to it, as represented in the figures. The mouth of each pipe ascends as the wheel is turned round by the stream, in the direction indicated by an arrow, and the water descends from C towards F, till it reaches the hollow axis, A, A, from the opening at the end of which it is discharged into the trough G, and thence conducted by troughs, as H, or other channels, to whatever place it may be wanted.

But if there be a necessity to raise the water higher than the axis of the wheel, we would recommend an ingenious machine, used for above twenty years at Zurich, for supplying a large dye-house there with water from the Limmat, and of which a description in the German language appeared in the third volume of the Zurich Acts, from whence the following account is translated.

The wheel itself differs little in appearance from other water-wheels. Its diameter, exclusive of the ladle-boards is not quite three feet. It is coated all over with tin plates, and forms a short cylinder, or rather drum, of the above diameter, and one foot thick. On its periphery the ladle-boards are fixed, as in other under-shot water-wheels, and by means of which it is put in motion by the stream. It turns on a hollow axis (like the last machine) of proportional thickness and length, and has one of its flat sides applied against a projection, or ledge, made round the axis, to which it is pressed close, and held fast by a wedge driven through the axis at the other side. That part of the axis which passes through the wheel is square, that the wheel may not slip, or be able to turn, without turning the axis with it: the remaining part of it is round. The wheel is hung in the water to about one third of its height, and supported in a moveable frame, so that it can be lowered, raised, or even taken out of the water at pleasure. In the periphery of the wheel are holes, by which the water enters. The axis turns as usual, on two pivots, one of which is of brass, considerably larger than the other, and hollow from end to end, communicating with the canal in the axis. The hollow pivot, which may be considered as a brass pipe, has its end fitted close to a leaden pipe, in which it turns. The leaden pipe, by a double bending, is confined to the wall of the dye-house, where it is bent perpendicularly upwards, and rises along the wall to the height of ten feet above the axis; it is there bent again under the eaves, and continued into the dye-house itself.

The singular and remarkable operation of this little wheel depends solely on its internal structure. The water entering at the circumference of the wheel, runs in a square spiral canal, which passes round the wheel, and consists of a number of circumvolutions, within one another, like the spring of a watch, till at length it comes into the axis. A necessary condition here is, that each of the inner circumvolutions be of the same magnitude with regard to their content, as the outer one; or that the width of the spiral canal be gradually enlarged in each circumvolution, in proportion as the diameter diminishes; that is, the bore of each of the inner spirals must be to the bore of the outer one, as the diameter of the latter is to the diameter of the former.

The wheel thus furnished with its spiral canal, is to be hung so deep in the river, that half a spiral, at least, may, in each revolution, be filled with water. To keep it in this state it would be necessary to immerse it to the axis, or further: but as its motion, at such a depth, would be extremely slow, a kind of scoop is made at the outer opening of the spiral pipe, which takes up so much water at once, as is sufficient to fill the due proportion of the outermost spiral in one revolution. One half of the outer spiral being thus filled with water, the other half remains filled with air: as the wheel turns the water and air pass into the second spiral, then into the third, fourth, and so on, till a sufficient number of turns brings the water and air to the axis, from whence they pass into the upright pipe, as already mentioned: thus the entrance and discharge of water continue without intermission, so long as the wheel is kept in motion. When the wheel scoops up just the proper quantity of water, and turns with due velocity, the water may be forced up in the perpendicular pipe to a height equal to the sum of the diameters of all the circumvolutions of the spiral canal.

If we consider the operation of this machine, we shall easily see the necessity of the inner circumvolutions being made to widen in the proportion above mentioned; and that, without this condition, the water passing from the large outer spiral, would be crouded and retarded in the inner, and in great part forced back.

It is also obvious that just half of one of the spirals must be filled with water at each revolution, for if less be taken in, there will be a diminution in the quantity delivered, and if more, it will be pressed too much together, and its quantity also diminished.

The velocity with which the wheel moves, or the number of revolutions it makes in a given time, is another essential point in regard to the quantity of water, and may considerably influence the quantity of water necessary to be raised. When this is known, and the height determined, it will be easy to construct a wheel in such a manner, as to answer the purpose intended.

We shall conclude our account of this ingenious contrivance, with the following directions for constructing it. The two flat sides of the wheel should be made of two strong circular pieces of good oak, the inner sides of which must be planed as smooth as possible, and fitted to one another; and to keep them from bending or warping, secured by pieces on the outside. The plan of the spiral lines is represented in Fig. 7. Plate XXVII. These spiral lines being marked out on the wood, a groove must be cut about a quarter of an inch deep, in order to make a channel for the partition, which must be formed of a thin piece of copper. The channel being filled somewhat more than half with good cement that will bear water, the piece of copper must be set in regularly, care being taken to keep the cement warm, or previously to heat the metal. The scoop also, which at every revolution of the wheel takes up a proper quantity of water from the river, may be made of the same metalline plate. The piece of copper for forming the partition must be cut at first exactly strait, and of an equal breadth throughout. This work being finished, the wheel must be put on the axis as far as the ledge made for it to rest against, and cemented. The second piece of wood requires little preparation: some cement must be spread all over it, and the whole surface covered with a thick piece of woollen cloth, which must also be done over with cement on both sides: while the whole continues warm, it must be put on the axis, and pressed close to the other part of the wheel, so as to cover the as yet open side of the spirals. The two parts are held firm together, by means of a wedge or key passing through the axis, and a proper number of screws, placed round the circumference: these screws are strong iron pins, somewhat longer than the wheel is thick, and a nut, when they are placed through the wheel, is screwed on the other. Thus the inside of the wheel, or drum is finished. The disposition of the ladle-boards, the shape of the axis, and the structure of the frame by which the machine is supported, will be partly understood from what has been already said, and more fully from Fig. 8. Plate XXVII.

It has been already obferved, that the wheel in the limmat is covered with tin plates; but this is of little or no confequence. It is however advifeable not to have one large opening, for the entrance of the water, but either a perforated plate, or a wire-grating nailed before it, in order to prevent weeds, or any other filth from paffing into the fpiral tube, and preventing, if not wholly ftopping, the courfe of the water.

The frame or fcaffold in which the wheel hangs, and the means of raifing or lowering it in the river, without difturbing the courfe of the water in the machine, deferves particular notice. It is plain from Fig. 8. that the wheel refts on two arms, which, for the greater fecurity, are bound together by crofs-pieces. At the fore-end they are both fufpended by iron chains, which pafs over a roller fo as to be wound off or on: on the other end they move on two ftrong joints or hinges. The communication of the leaden pipe, with the brafs one, or hollow pivot, at the end of the axis, is drawn on a larger fcale, in Fig. 9. This pipe is bent clofe by the pin, to a right angle, and goes horizontally along one of the arms of the frame as far as the hinge, (fee Fig. 8.) where it is again bent to a right angle, oppofite to the dye-houfe, and communicates in the fame manner as the hollow pivot of the axis, with another horizontal pipe, in which it moves round freely, without any impediment to the paffage of the water, in raifing or lowering the wheel. This large pipe paffes under a ftage built along the wall of the dye-houfe, and thence up the wall, where it diftributes the water in the manner reprefented in the figure.

But though water is fo neceffary to the growth of plants, yet in lands that abound with it, there is a neceffity for conveying it away, the beft methods for doing which the reader will find under the articles Bog, Drawing, Moor, &c.

Water-Farcy, a difeafe incident to horfes, and is of two kinds; one the product of a feverifh difpofition terminating on the fkin, as often happens in epidemical colds; the other is dropfical, where the water is not confined to the belly and limbs, but fhews itfelf in feveral parts of the body, by foft fwellings yielding to the preffure of the finger. This laft kind ufually proceeds from foul feeding, or from the latter grafs and fog, that often comes up in great plenty with continued cold rains, and breeds a fluggifh vifcid blood. In the former cafe, I have feen the limbs and whole body enormoufly fwelled, and very hard, the belly and fheath greatly diftended; which were as furprizingly reduced in four and twenty hours, by flight fcarifications within fide the leg and thigh, with a fharp penknife, and three or four ftrokes on the fkin of the belly on each fide the fheath; from thefe fcarifications there was a conftant and furprizing large dripping of water, which foon relieved the horfe; when a few purges compleated his recovery.

In the other fpecies of dropfy the curative intentions are to difcharge the water, recover the crafis or ftrength of the blood, and brace up the relaxed fibres throughout the whole body. To this end, purge once a week or ten days; and give intermediately either of the following drinks, or balls.

> Take black hellebore frefh gathered, two pounds; wafh, bruife, and boil in fix quarts of water, to four; then ftrain out the liquor, and put two quarts of white wine on the remaining hellebore, and let it infufe warm forty-eight hours; then ftrain off, mix both together, and give the horfe a pint night and morning.

> Take nitre two ounces, fquills powdered, three drams, or half an ounce; camphor one dram, honey enough to form into a ball, to be given once a day alone, or wafhed down with a horn or two of the above drink.

> Take of the leaves and bark of elder, of each a large handful; chamomile flowers half a handful, juniper berries bruifed two ounces; boil in a quart of water to a pint and a half, to which add honey and nitre, of each one ounce.

Give this drink every night, or night and morning; and to compleat the cure, and ftrengthen the whole body, give a pint of the fubfequent infufion every night and morning, for a fortnight, fafting two hours after it.

> Take gentian root and zedoary, of each four ounces; chamomile flowers and the tops of centaury, of each two handfuls; Jefuits bark powdered two ounces; juniper berries four ounces; filings of iron, half a pound: infufe in two gallons of ale for a week, fhaking now and then the veffel.

Before we clofe this article, we think proper to lay down the fymptoms of an incurable farcy, that the owners of fuch horfes may fave themfelves unneceffary expence and trouble in their endeavours to obtain a cure.

When a farcy by improper applications, or by neglect has fpread and increafed; or after long continuance refifted the medicines above recommended; if frefh buds are continually fprouting forth, while the old ones remain foul and ill-conditioned; if they rife on the fpines of the back and loins; if the horfe grows hide-bound, and runs at the nofe; if abfceffes are formed in the flefhy parts between the interftices of the large mufcles; if his eyes look dead and lifelefs; if he forfakes his food and fcours often, and his excrements appear thin, and of a blackifh colour; if the plate, or thigh vein continue large after firing, and other proper applications: thefe fymptoms denote the diftemper to have penetrated internally, and that it will degenerate into an incurable confumption: it is alfo moft probable, that the whole mafs of fluids are tainted, and become incurable by art. *Bartlet's Farriery, pag.* 193.

WATTLE, a kind of hurdle formed with fplit wood, and ufed for making folds for fheep.

WAX, *or* Bees-Wax, a fubftance formed by bees from the farina of flowers. *See the article* Bee.

WAY-BREAD, plantain.

WEANEL, an animal newly weaned.

WEED, any plant growing in a field different from what the farmer intended.

There is not a field where we do not find fome of thefe; they grow in the greateft plenty on the richeft foils.

Weeds will appear impediments to vegetation, if we confider the following particulars.

They rob the plants we defire to cultivate of their food; they prevent thefe plants from branching out from the root, and they leffen the vegetable pafture in the land where they are fuffered to grow.

Weeds are nourifhed by the fame food that would nourifh ufeful plants; and therefore, when allowed to grow along with them, muft rob them of part of their food. Although it is allowed, that the food of all plants is not exactly of the fame kind; yet as plants fuck in whatever juices, or fmall particles of matter are touched by their roots, it may be juftly faid, that all kinds deprive the earth of that vegetable food which would nourifh others. Experience convinces the farmer of the truth of this: for he finds, that his crop is bad in proportion to the quantity and kinds of weeds with which his land is infefted.

Weeds cover the furface of the land on which they grow, and thereby, confining the plants we defire to cultivate, prevent them from branching out from the root. For all plants, when confined by others at their fides, inftead of branching out, as fome of them are inclined to do, make vigorous efforts to get above thofe by whom they are confined.

Some perfons have attempted to fhow, that corn never wants room to grow; and that it is the want of food alone which makes fome plants decay, when they are fet too thick. If this is true, weeds can do no harm to plants, by covering the furface, and confining them while they grow. But let a perfon caft his eyes upon a plantation of any kind, and he will immediately obferve, that where the plants are placed very near to each other, they ftretch out chiefly to the length; and where they are placed at a greater diftance, they grow not fo much to the length, but more to the thicknefs, and branch out on all fides. So that the proportion of nourifhment which the plants receive, makes them grow either to the length principally, or to the thicknefs, and branch out, according as they are placed near, or at a diftance from each other. The fame thing happens, when there are many weeds growing amongft corn. Some fields are fo much infefted with weeds, that, though no grain is fown, the plants come up very thick.

thick. This obliges the farmer to give plenty of feed: in confequence of which the furface is quite covered; and the plants of corn being confined by the weeds, inftead of branching out from the root, and producing two or more ftalks, as they are naturally difpofed to do, pufh up one ftalk only, that fo they may the more eafily get above their rivals. The proportion of nourifhment which they receive, makes them grow to the length, inftead of branching out from the roots; makes them produce one ftalk and ear only, inftead of many. Experience confirms the truth of this. When land is rich, and at the fame time much infefted with weeds, the plants of corn grow tall enough; but feldom have more than one ftalk.

Some kinds of weeds have great numbers of fmall roots, which they extend to a great diftance. Thefe roots bind the foil in fuch a manner, as to leffen the vegetable pafture; or rather, make it very difficult to enlarge it by tillage. It may be obferved, that when a field is much infefted with quickening grafs, the foil is fo firmly bound together by the roots, that it is not poffible to pulverize it. When ploughed, the earth of the furrow is turned over whole, and the harrows fcarcely make any impreffion upon it.

It is of great importance, therefore, to know how to deftroy thefe ufelefs and noxious plants, that fo all the vegetable food in the foil may be applied to the nourifhment of the ufeful plants we defire to cultivate; that thefe ufeful plants may have room to extend themfelves, and branch from the root on all fides; and that the vegetable pafture, which, by the rain that falls, and the natural weight of the foil, is always leffening, may be the more eafily enlarged.

Different kinds of weeds.

Plants are commonly divided into two forts; annuals, that is, fuch as in one year come to perfection, carry feed, and die; and perennials, that is, fuch as continue in life for more years than one. Annual plants are almoft all propagated by the feed. Perennials are propagated, fome by the feed, others by the root, and a third fort both by the feed and root.

Weeds may be divided in the fame manner, into annuals and perennials. But, in treating of the methods of deftroying them, we will be better underftood, if they are divided into thefe two forts; weeds that are propagated by the feed, and weeds that are propagated by the root. It is needlefs to confider the weeds that are propagated both by the feed and the root, as a third fort. For when their feeds infeft the land, they muft be treated as weeds that are propagated by the feed; and, when their roots infeft the land, they muft be treated as weeds that are propagated by the root. It is neceffary, however, to divide weeds into thefe two forts, into which we have divided them: for, in fome cafes, that kind of management proper for difcouraging the one fort, tends to encourage the growth of the other.

But, befides thefe two forts of weeds mentioned, it will not be improper that we likewife take notice of thofe fhrubs by which fome land is greatly infefted. Thefe, though they are not commonly reckoned in the clafs of weeds, and though fome of them may have their particular ufes; yet, as they are plants different from what the farmer defires to cultivate in his fields, they fall under the definition which we have given of weeds, and fhall be reckoned by us a third clafs.

Methods of deftroying weeds.

The deftroying of weeds is certainly one of the moft important parts of agriculture. By allowing them to grow, we allow the land, as was formerly obferved, to be robbed of its vegetable food, and its vegetable pafture to be greatly leffened.

It may be inquired, what becomes of this vegetable food of which they rob the land? it is either conveyed to the air, and fent to enrich other land, or it is turned into a form that renders it deftructive.

When weeds wither and putrefy above ground, the falts and oils which they contain, and of which they deprived the land on which they grew, become volatile, and fly off into the air, and leave little more than their earth remaining.

When weeds carry feed, and fhed it upon the land, and when the roots, by the nourifhment they receive, are enlarged and extended; the vegetable food, of which they have deprived the land, is turned into a form that renders it deftructive, into feeds and roots, by which the land is further exhaufted.

The feeds and roots of weeds, though deftructive to ufeful plants, by robbing them of their food, yet they contain vegetable food in themfelves; and, when the feeds are picked up by birds, and the roots eaten by animals, the vegetable food is carried off. But, if thefe weeds are deftroyed, and reduced to a ftate of corruption, the vegetable food, which they have taken from the land, and rendered deftructive, is reftored to it, and becomes beneficial: fo that land that is poor, and unfit for carrying crops of ufeful plants, by being full of weeds, may be made rich and fertile, by deftroying them.

From thefe things it appears, that the deftroying of weeds is one of the moft important parts of agriculture. As it is important, fo likewife it is difficult.

There is fcarcely a field, in which we will not obferve weeds of the two firft kinds mentioned; of the kind that is propagated by the feed, and the kind that is propagated by the root. Some of thefe, perhaps, it may be eafy to deftroy, as they are foreigners, and not adapted to the foil; but others of them being natural to the foil, in that kind of it that is moft proper for them, it may be expected, not only that it will be very difficult to deftroy them, but alfo, that, by the culture given to the land, they will thrive wonderfully, carry great crops of feed, and multiply and extend their roots. As the deftruction of weeds is then fo important and difficult, it is a work that muft be particularly attended to.

Weeds have been divided into three forts. To deftroy thefe different forts, different management is required. It is neceffary therefore to treat of them feparately.

Methods of deftroying weeds that are propagated by the feed.

Weeds are very different in their natures. The feeds of fome of them will putrefy in a few years, if they lie moift in the earth, and are prevented from vegetating. But the feeds of others will lie many years in this fituation, without having their vegetative power deftroyed. This we know from experience. Land infefted with different kinds of weeds, has been frequently thrown out into grafs, and allowed to remain in that fituation for fome years. Though allowed to lie only a few years, fome kinds of weeds are found to be deftroyed, when the land is broke up again; but, though it lie twenty years, fome other kinds are found in as great plenty as before.

The firft fort may be deftroyed by turning the land infefted with them, from tillage into grafs, and allowing it to remain in that fituation for five or fix years.

Both forts may be deftroyed by bringing the feeds to vegetate, and then tearing up the young plants. Seeds will not vegetate without air. Some require a greater proportion, and fome a fmaller. The fmall feeds will not vegetate without a very great proportion of it. It may be obferved, in fallowing land which is full of weeds, that great numbers of them appear after every ploughing. This fhows, that fome of the feeds had not a fufficient quantity of air, in their former fituation, to make them vegetate. Now, to give thefe fmall feeds the proportion of air neceffary for them, they muft be brought near the furface, and the earth about them rendered free and open. If the land is frequently ftirred and turned over, both thefe will be done. For every time the land is ftirred and turned over, fome feeds, that before lay deep, are brought near the furface, and the earth about them alfo rendered free and open: and, befides, the plants that have appeared are thereby torn up and deftroyed.

Every farmer that practifes fummer-fallowing, is now fully convinced of the truth of this. For he obferves, when the feafon is favourable, and his fallow is well and frequently ploughed and harrowed, and time allowed betwixt every ploughing and harrowing for the weeds to vegetate, that his land, for feveral years, is not fo much infefted with weeds as before.

It has been obferved, that feeds will not vegetate without air, and that to give the fmaller kinds the quantity which they require, they muft be brought near the furface, and the

the earth around them rendered free and open. It is neceſſary likewiſe to obſerve, that water is as requiſite to promote vegetation as air; and that the bringing ſeeds near the ſurface, and rendering the earth free and open around them, as it ſupplies them with air, tends to deprive them of water. In the performance, therefore, of thoſe operations by which the land is ſtirred and turned over, to promote the vegetation of the ſmall ſeeds, great care muſt be taken to preſerve the ſap, as much as is poſſible. This will be done, if, in ſtirring the land, the ſurface is made ſmooth and plain. It is obvious, that, when the ſurface is rough and uneven, the drought has eaſy acceſs; but, when it is ſmooth and plain, the winds have leſs influence, and the ſap is better preſerved. Every farmer will obſerve, that, in dry weather, when land is allowed to lie ſome time after it has been ploughed, without being harrowed, the drought has eaſy acceſs, the ſap is exhaled, and the ſeeds in it, though near the ſurface, and the earth around them free and open; yet, being deprived of water, are prevented from vegetating: whereas, when the land is harrowed immediately after it is ploughed, the ſap is preſerved, and the ſeeds ſpring up. Hence the cuſtom of ſowing barley immediately after the plough. Barley is commonly ſown in a dry ſeaſon; and therefore the land is not allowed to lie long after it is ploughed, leſt the ſap ſhould be exhaled; but is immediately ſown and harrowed, by which the ſap is preſerved.

The vegetation of ſeeds in land is promoted, not only by ſtirring and turning over the land, but alſo by the application of dung and ſome other manures. Dung raiſes a fermentation; this opens the pores of the ſoil, allows the air to reach the ſeeds, and gives them liberty to put forth their roots. If dung, therefore, is laid upon land infeſted with weeds, and the land carefully ſtirred and turned over ſeveral times, all the ſeeds in it, by degrees, will be brought to vegetate; and thus the weeds will be deſtroyed.

It muſt be owned, that this practice, though proper for deſtroying weeds, may, in ſome caſes, deſtroy ſome of the virtues of the dung, before it is applied to promote the vegetation of the uſeful plants we deſign to cultivate. Dung promotes vegetation, by producing a fermentation in the ſoil upon which it is laid; and, by this fermentation, ſeparating its particles. If this fermentation is, in a great meaſure, over before ſeed is ſown, the natural weight of the ſoil, making it ſubſide, will render the vegetable paſture, while the plants are growing, much leſs than it would have been, if the dung had not been ſo ſoon laid on; and more harm may be done by this, than advantage gained by deſtroying the weeds. But, though it may be improper to follow this method, when ſeed cannot be ſown for a conſiderable time after the dung is laid on, as is the caſe ſometimes when ſummer-barley is ſown on fallow; yet it may anſwer very well, when ſeed is to be ſown ſoon after, as is the caſe when wheat is ſown. The advantages ariſing from the deſtruction of the weeds, though not in the firſt caſe, yet in the laſt, may probably do more than overbalance the loſs ariſing from ſome part of the ſtrength of the dung being exhauſted before ſeed is ſown.

It may, perhaps, be thought a little ſurprizing, that dung ſhould be propoſed as a means of deſtroying weeds, when it is univerſally conſidered as a great encourager of them. It is certain, that the laying dung upon land makes more weeds appear, than otherwiſe would do. If the ſeeds of theſe weeds are in the dung, it muſt be owned, that it increaſes, and not diminiſhes their number. But, if the ſeeds are in the land, and the dung only makes them vegetate, it becomes a proper means of deſtroying them.

It ſeems to be the general opinion, that the great plenty of weeds that appear on land after it is dunged, are produced from ſeeds mixed with the dung. But there are ſome reaſons to believe that this is a miſtake.

It is obſerved, that dung produces weeds, when it is taken from a dung-hill, ſo much heated as to deſtroy the vegetative power of any ſeed.

It is obſerved likewiſe, that the ſame dung produces weeds, according to the nature of the land on which it is laid. It often happens, that dung carried from a town is laid upon different ſoils; and it is certain, that this dung does not produce the ſame kind of weeds on all ſoils, which it would do, if the weeds aroſe from ſeeds, mixed with it; but always produces the weeds, with which the ſoil upon which it is laid is naturally infeſted.

Theſe obſervations make it very probable, that the great quantity of weeds produced by dung, is entirely owing to the fermentation occaſioned by the dung; by which almoſt all the ſeeds near the ſurface, receiving a proper quantity of air, are thereby brought to vegetate.

To this it may be objected, That ſuch numbers of weeds do not appear upon land that is new marled, as upon land that is dunged. But, in anſwer to this, let it be obſerved, that a great quantity of marle is laid on, and in large pieces, and that it is ploughed in with a ſhallow furrow: and therefore, though a fermentation may be raiſed, yet the undiſſolved marle prevents a great part of the ſoil from being expoſed to the air, in ſuch a manner as to make the ſeeds in it vegetate; and alſo occaſions ſuch a hollowneſs, that, after the ſeeds begin to vegetate, ſuch of the plants as are tender (and ſeveral ſorts of them are not ſo hardy as corn) are eaſily deſtroyed by drought or froſt.

Before we leave this article, it is neceſſary to obſerve, that the ſeeds of ſome weeds, particularly the different ſpecies of the thiſtle, are carried to a conſiderable diſtance by the wind; and where any earth is thrown up in ſuch a manner as to intangle them, as at the root of a hedge, or ſide of a ditch, there they appear in great plenty. It is ſurpriſing, that many farmers allow them to grow there undiſturbed: the conſequence of which is, that their ſeeds are carried in great plenty into the adjacent fields, and thereby great damage is done; which might have been prevented by cutting them down, at a ſmall expence, before their ſeeds were ripened.

Methods of deſtroying weeds that are propagated by the root.

There are many different kinds of weeds propagated by the root, and theſe of very different natures. Some of them infeſt the land that is in tillage, and others the land that is in graſs. Any perſon may ſatisfy himſelf of this, by inſpecting our fields. The farmer is very ſenſible of it: he knows that ſome kinds of weeds flouriſh and increaſe in his land, while in tillage, if he does not take all pains to diſcourage them; and when he lays down his land in graſs, other kinds that did not appear before, ſoon diſcover themſelves; and, if undiſturbed, continue to increaſe, while the land remains in that ſituation.

The firſt ſort, it ſeems, have ſuch a tender blade, and ſuch tender roots, that they cannot pierce earth that is hard; but are of a kind that increaſe very faſt, when the ſoil is free and open.

The ſecond ſort have the blade and roots ſo ſtrong, that there is ſcarcely any ſoil that, of itſelf, will become ſo hard and ſtiff, as to prevent them from making their way through it; but are of ſuch a nature, as to be eaſily torn up, when the land is free and open; and do not eaſily ſtrike root again when torn up.

The natures of theſe weeds point out methods of deſtroying them.

The firſt ſort, as they chiefly infeſt land in tillage, may be deſtroyed by turning the land from tillage into graſs, and allowing it to remain for ſome years in that ſituation. This is confirmed by experience. Land over-run with quickening-graſs, and other root-weeds of the ſame kind, is frequently laid down in graſs, and allowed to continue for ſome years without being ploughed. This land, when broke up again, if allowed to lie in graſs for ſix or ſeven years, is found to be clean, and the roots of the weeds deſtroyed.

The number of years neceſſary for deſtroying the roots, depends upon the nature of the ſoil. If the ſoil is naturally hard and ſtiff, it is the ſooner brought to ſuch a ſituation, as to prevent the roots and blades of the weeds from piercing it. But, if it is naturally ſoft and ſpungy, it takes a longer time before it is brought to that ſituation. For while the blade, or roots of the weeds, can pierce the ſoil, their vegetation is not prevented. In ſome ſoils, it is ſix or ſeven years before the roots of the quickening-graſs are deſtroyed.

The number of years found neceſſary for deſtroying theſe root-weeds, has, no doubt, been partly the occaſion of eſtabliſhing the practice commonly obſerved. Three

crops

crops of corn are taken, and then the land is allowed to lie ſix years in graſs, or lea. At the end of theſe, the farmer ſuppoſes that the lea is come to maturity, and fit again for being ploughed. When it is only two or three years old, it is called, in ſome parts of the country, calf-lea; and, if ploughed at that age, is commonly very full of roots.

The ſowing land with graſs-feeds, inſtead of turning it out into lea, deſtroys the roots of theſe weeds ſome years ſooner. For thereby a ſward being brought immediately upon the ſurface, the land becomes firm, the blades of the weeds are unable to pierce it, and the roots are deprived of air. Ryegraſs-feed, or the common hay-feed, is the moſt proper for this. For the plants ariſing from theſe, ſoon cover the ſurface, and, by the number and ſmallneſs of their roots, bind the ſoil. Clover, particularly the broad clover, is improper. For the roots of it being large, they open the ſoil in growing and extending themſelves, and thereby prevent it from arriving at that degree of firmneſs, neceſſary for deſtroying the weeds ſo ſoon, as if no graſs-feeds are ſown, but the land immediately turned into lea.

The ſecond ſort may be deſtroyed by turning the land infeſted with them, from graſs into tillage; and it is not neceſſary to continue it long in this ſituation, for the weeds commonly diſappear after the firſt ploughing.

But as it may be inconvenient to turn a field infeſted with weeds, from graſs into tillage, or from tillage into graſs; it is neceſſary to conſider, if there are any methods of deſtroying theſe weeds, without altering the ſituation of the land.

When land in tillage is infeſted with weeds, they may be deſtroyed by frequently ſtirring and turning it over in dry weather. For the weeds being removed out of their place, the drought prevents them from ſtriking root again. The ſtirring the land in wet weather, is rather hurtful than beneficial. For though the roots of the weeds are removed from their place, yet the weeds themſelves are only tranſplanted. If the land is wet, they ſoon ſtrike root again; and the quickening-graſs, in particular, having its paſture enlarged, makes quicker progreſs than ever. But, if the land is dry, the weeds do not ſo eaſily ſtrike root again; or, if ſome of them ſhould ſtrike root, they continue for ſome time in a languiſhing condition, and if removed out of their place, while in this condition, are eaſily deſtroyed by the drought. If land then is frequently ſtirred and turned over, by degrees all the weeds will be deſtroyed: for, by every ſtirring or ploughing, ſuch of them as are in a languiſhing condition are deſtroyed, while thoſe that are ſtrong and vigorous are weakened.

When land is to be freed from ſeed-weeds, it cannot be made too fine, nor the ſurface too ſmooth; for the more perfectly theſe are done, the greater number of ſeeds are brought to vegetate. But, when land is to be freed from root-weeds, it cannot be turned up in too large pieces, nor the ſurface left too rough: for the larger the pieces, and the rougher the ſurface, the drought has the eaſier acceſs, and the roots are the more effectually deſtroyed.

When land in graſs is infeſted with weeds, and it is inconvenient to turn it into tillage, the weeds themſelves muſt be pulled up by the root, or frequently cut; which are the only ways of deſtroying them.

Some perſons aſſert, that ſheep are very fond of the yellow rag-weed, by which light land, when laid out in graſs, is very much infeſted. If this is true, the putting ſheep to paſture upon this graſs, for a ſeaſon or two, will effectually deſtroy this weed. This may be the more ſafely recommended, as the trial, though it does not ſucceed, cannot be attended with any danger or loſs.

Some land, after being a few years in graſs, is liable to be over-run with fog. This, it is ſuppoſed, is owing to the ſoil becoming ſoft and ſpungy near the ſurface. If this is the caſe, rolling, which makes the ſurface firm, will be of ſome uſe to deſtroy this pernicious weed. It may be obſerved, that, when there is a foot-path through a graſs-field over-run with fog, not ſo much frequented as to break the turf, the graſs upon the path is clean, without any mixture of fog.

There is a third ſort of weeds found to infeſt both the land that is in tillage, and the land that is in graſs. This ſort have not only the blade and roots very ſtrong, ſo as to be able to pierce the ſoil, though hard, but alſo are of ſuch a nature, as makes it difficult to tear them up; or have their roots of ſuch a kind, that they may be divided into a great number of plants.

Theſe weeds cannot be deſtroyed, either by turning the land infeſted with them, from tillage into graſs, or from graſs into tillage: but they may be deſtroyed by the methods mentioned, when the ſituation of the land is not changed. If the land is in graſs, they may be deſtroyed by digging them out, or by frequently cutting them. And, if the land is in tillage, they may be deſtroyed by frequently ſtirring and turning it over in dry weather. This work muſt be performed with ploughs properly made for cutting their roots. This kind of weeds puſh their roots very far down, and their roots are ſo tough and hard, that our common ploughs ſeldom break them. If there are any ſtones in the land, they puſh their roots among the ſtones; and, in ſuch places, the plough not having freedom to act, they continue undiſturbed. In this land too the plough, moſt proper for cutting theſe roots, cannot go with ſafety. But if the ſtones are dug out, and the land ploughed with a broad pointed ſhare, the roots, by degrees, will be cut, and the weeds deſtroyed.

Beſides theſe three ſorts of weeds mentioned, there is a fourth that chiefly infeſts land that is wet. Frequent cutting, and even digging out by the root, have been tried to deſtroy them, but to no purpoſe. They are not to be ſeen on dry land, and, when on land only inclining to be wet, appear very weak. This points out draining to be the proper method of deſtroying them, which indeed does it effectually.

We ſhall now conclude this article with obſerving, that all kinds of root-weeds, and many kinds of the ſeeds of weeds, may be deſtroyed by depriving them of air. For air is neceſſary not only to the vegetation, but alſo to the life of every plant.

When land is in tillage, the weeds may be deprived of air, either by burying them deep in the earth, or covering the ſurface. Trenching does the one, and a good crop of peaſe, potatoes, or any other plants that lie thick on the ſurface, does the other.

Fog, by which ſome lands in graſs are much infeſted, may be deſtroyed in the ſame manner. The method propoſed is this: the graſs muſt be kept from the month of March to the month of December, for winter-paſturing, and the next ſeaſon preſerved for a crop of hay. The fog being, by this management, covered for two ſeaſons by the graſs, is thereby deſtroyed.

As different methods are neceſſary in the extirpation of different weeds, and it is of ſome importance to know which of them are perennial, and which only annual, we have added a liſt of the moſt remarkable weeds which infeſt the arable and graſs lands in England, ranged according to their duration. A pomp of names is carefully avoided, and thoſe which Mr. Hudſon has given in his Flora Anglica are choſen: it is a misfortune that many farmers will not know what plants are meant by ſome of theſe names; but it is a misfortune ſcarcely to be avoided, ſince the Engliſh names of vulgar plants are ſo various; altering not only with the county, but with the place, and even ſometimes depending on the whim of a common labourer.

By far the greater number of annual weeds infeſt the arable lands: in graſs lands the perennials chiefly flouriſh. The reaſon is obvious; in the former the roots are continually deſtroyed by cutting; in the latter they are made to ſpread by cutting or eating down the ſtems: perennials uſually require more than a year to come to perfection; and the ſeeds by which annuals are propagated, are not ſo readily received into the more compacted turf, as into land whoſe parts are conſtantly undergoing a ſeparation.

The annual weeds which infeſt arable lands and gardens are chiefly theſe,

Ivy-leaved ſpeedwell, or ſmall henbit. April.
Annual darnel-graſs.
Bearded oat-graſs, bearded wild oats, or haver.
Little-field madder. May.
Cleavers, or gooſe-graſs. May.
Parſley-piert. May

Pearl-

Pearl-wort, or chickweed breakftone. This fmall weed is very apt to infeft gravel-walks; and if it be fuffered to feed, will increafe prodigioufly, and grow very troublefome. June.

Baftard alkanet. May.

Small wild buglofs. June.

Male pimpernel. May.

Venus's looking-glafs, or codded corn-violet. June.

Dodder, hell-weed, devil's-guts, or fcald. July.

This is found chiefly on beans; it ftrangles the crop, and draws its nourifhment from the plants about which it entwines itfelf. It infefts alfo hops and flax.

Small corn-parfley. Auguft.

Goofefoot of feveral kinds flourifhes on dunghills, and is often fuffered by the farmers to grow there unmolefted, by which the dung is much exhaufted. Auguft.

Fool's parfley. This is generally allowed to be a ftrong poifon, and is very common in gardens.

Shepherd's needle, or Venus's comb. June.

Common chickweed. The peft of gardens.

Knot-grafs. This plant is remarkably full of feed, and propagates itfelf furprifingly: it will grow any where, particularly in places that are much trodden. The fparrows, and other fmall birds, a very fond of its feeds. June.

Black bindweed. June.

German knot-grafs, or annual knawel. Auguft.

Purple-flowered chickweed, or fpurrey; on fandy lands. June.

Cockle. June.

Corn fpurrey. Auguft.

Petty-fpurge. July.

Sun-fpurge, or wart-wort. Thefe are both very common in gardens. July.

Red-poppy, or corn-poppy. June.

Wild larkfpur. This has increafed fo much of late years in Cambridgefhire, as to become one of the common weeds among the corn.

Adonis flower, pheafant's eye, red maithes, red Morocco. Frequent in the corn-fields of Kent.

Corn crowfoot. The feeds of this do not come forth till the fecond year after fowing. June.

Upright ground-ivy.

Red archangel, or dead-nettle. Common in gardens.

Great henbit.

Narrow-leaved all-heal.

Nettle-hemp, or hemp-leaved dead-nettle.

Red eye-bright.

Fluellin; fharp-pointed, and round-pointed.

Gold of pleafure; among the flax. June.

Shepherd's purfe.

White-flowered charlock, with a jointed cod. June.

Yellow-flowered ditto.

Wild muftard, or charlock. May.

Thefe three, particularly the laft, are the *opprobium* of the farmers: they who will not be at the pains to extirpate them by hand, might do well at leaft to run a fcythe over the crops, while the weed is in flower, and before their fpring-corn (for it is that which is chiefly troubled with it) is got up too high.

Fumitory. April.

Yellow vetchling; very common in the corn-fields about Cambridge.

Common fow-thiftle. June.

Common groundfel.

Corn-marigold; the peft of light lands: it is not fond of dung. In Denmark there are laws for the extirpation of this weed. June.

Common camomile, or corn-feverfew. June.

Stinking May-weed. June; fomewhat earlier than the laft.

Blue-bottles. July.

Panfies, or heart's-eafe.

Leffer nettle. Auguft.

Oracee, of feveral kinds; along with the goofefoot, on dunghills, and in gardens. Auguft.

Annual weeds in pafture-grounds are only the following.

Purging-flax. May.

Knot-grafs. This fpreads chiefly by the path fides, and where dung or rubbifh has lain.

Yellow rattle, or cock's-comb, vulgarly penny-grafs; in moift meadows. This keeps its ground, for the feeds are ripe at the time of cutting hay. June.

Eye-bright; in dry paftures.

Red eye-bright.

Heart-trefoil, or clover. This is always mixed with clover, and particularly with the hop-trefoil, or non-fuch. It is a harfher plant, full of hard, prickly feed-veffels, and therefore not a good food for cattle; it is eafily known from other clovers, by its feed-veffels, and the fpots upon its leaves.

Common creeping moufe-ear. May.

Smooth fuccory hawk-weed. June.

Star-thiftle; in dry barren paftures, and by way-fides. July.

Hairy fheep's fcabious; on high paftures.

Biennial weeds in corn.

Viper's buglofs, called in Cambridgefhire, &c. cat's tail. It infefts the corn very much every third year. July.

Mithridate-muftard, or baftard-crefs.

Common melilot. The feeds of this ground along with wheat, are known to give bread a very ftrong tafte. June.

Spear-thiftle. July. This, with many other kinds of thiftles and other weeds, with downy feeds, are fuffered to ftand on banks, way-fides, and fallow lands, in order to ferve for a conftant fupply of weeds. If the wafte places were run over with an old fcythe, this evil would foon be prevented.

Biennial weeds in paftures.

Wild-carrot, or bird's neft. June.

Cow-parfnep. July.

Common-mallow. May.

Rough-fuccory hawk-weed. July.

Stinking hawk-weed. June.

Mufk-thiftle. July.

Wild carline-thiftle. June.

Perennial weeds in corn.

Field fox-tail, or moufe-tail-grafs.

Common wheat-grafs, dog's-grafs, quick-grafs, or couch-grafs. As every piece of this moft deteftable creeping weed will grow, there is no way of deftroying it, but by ploughing up the ground thoroughly, picking it out, and burning it.

Common field-fcabious. Auguft.

Small bind-weed. This fpreads its roots deep and wide; and as every piece of them will grow, it is no eafy matter to eradicate this pernicious plant.

Bladder-campion, white corn-campion, fpattling-poppy. July.

White-campion. May.

Small-bramble, or dewberry-bufh. June.

Corn-mint. Auguft.

White-archangel, or dead-nettle; chiefly in gardens and under hedges.

Corn reft-harrow, or cammock. The roots of this mat together with great ftrength, and are therefore very troublefome, where land is to be ploughed for corn. This property, however, makes it an excellent plant to fet on fea and fen banks, to keep them firm and compact. July.

Tree fow-thiftle. Auguft.

Way-thiftle. The fallows are ufually well overfpread with this weed, whofe downy feeds are eafily fpread by the wind. July.

Great knap-weed, or matfellon. Its roots are very ftubborn and hard. July.

Corn horfe-tail.

Perennial weeds in paftures.

Devil's-bit. June.

Great-plantain, or waybread. June.

Ribwort, or ribwort-plantain. June.

Yellow ladies bed-ftraw, or cheefe-renning. It is a vulgar notion, but a falfe one, that this herb will turn milk. The good women are fond of putting fome favourite plant into their rennet, and thus attribute to it a quality which it has no right to claim. July.

W E E

Cowſlips, or pagils. April.
Round leaved bell-flower. Auguſt.
Leſſer throat-wort, or Canterbury-bells. July.
Meadow-ſaxifrage. Auguſt.
Burnet-ſaxifrage. Auguſt.

Crow-garlic. This gives milk and butter an inſufferable ſtrong taſte. June.

Broad-leaved dock. July.
Common-ſorrel. May.
Sheep's ſorrel.
White ſaxifrage, or ſengreen. May.
Agrimony. June.
Drop-wort. Hogs are fond of the roots. July.

Meadow-ſweet. June. Only in very moiſt meadows. Goats are very greedy of this plant, which neither horſes nor kine will touch.

Tormentil, or ſeptfoil. June.
Creeping-crowfoot, or butter-cups. May.
Bulboſe-crowfoot, or butter-cups. May.
Upright meadow-crowfoot. June.

The three laſt, which occupy ſo much room in almoſt all meadows, are not eaten by any ſort of cattle, being of a very hot and acrid nature; ſo that the notion of their giving butter a yellow tincture, is as falſe as it is vulgar.

Pilewort, or leſſer celandine. April.
Meadow-rue. June.
Bugle. May.
Self-heal. Auguſt.
Common yellow toad-flax. July.
Common ladies-ſmock, or cuckow-flower. April.
Crowfoot cranesbill. June.
Common broom: in dry paſtures. May.
Reſt-harrow, or cammock; in barren grounds.
Dandelion. April.
Rough dandelion. May.
Yellow devil's bit. Auguſt.
Long-rooted hawk-weed. May.
Dwarf carline-thiſtle. July.
Common coltsfoot; in watery days. March.
Common butter-bur; in moiſt meadows. March.

Ragwort, or ſeagrim. Nothing touches this plant; though a perennial, it comes up eaſily by hand, when young, or when the ground is moiſt. July.

Fleabane; in moiſt places. Auguſt.

Common daiſie. We do not find that any cattle willingly eat of this plant, which occupies ſo large a part of our paſtures.

Greater daiſie, or ox-eye. May.

Common yarrow, or milfoil. The roots of this creep abominably, eſpecially where rubbiſh, or dung has been laid. May.

Common knap-weed, or matfellon. July.

Orchiſes of various ſorts; as,

Butterfly orchis. May.	In moiſt meadows.
Male fool-ſtones. May.	
Female fool-ſtones. May.	
Male-handed orchis. May.	
Female-handed orchis. June.	
Red-handed orchis. June.	
Purple late-flowering orchis. June.	In dry paſtures, chiefly in chalk.
Little purple-flowered orchis. May.	
Man orchis. June.	
Frog ſatyrion. May.	
Triple ladies traces. Auguſt.	
Bee orchis. June.	

Carexes of various ſorts; in low meadows and fenny grounds. Theſe are all very harſh: they are, however, mowed to fodder cows with in winter.

Common nettle.

Adder's tongue; in moiſt meadows.

Female fern, or brakes; on dry barren land. It ſtrikes its roots far and wide, and is difficult to eradicate even with the plough.

Moſſes of various ſorts. Old paſtures are moſt infeſted with theſe. Ploughing is the only effectual way of deſtroying them.

We have added the time in which moſt of the foregoing plants begin to flower; becauſe about that time it is proper they ſhould be deſtroyed.

Though the reader will find an account of many of the weeds enumerated in the above catalogue, under their proper articles, yet we were perſuaded that a general deſcription of the perennial weeds would not be unacceptable here, as two much cannot be ſaid to enable the huſbandman to know theſe pernicious plants, and exterminate them as ſoon as poſſible.

Annual darnel-graſs is called white darnel by Gerard, and in the ſouthern countries crap; though, in Worceſterſhire, they call the buck-wheat by this name. It was a ridiculous old notion, that this weed, which has ever been ſtigmatized as one of the greateſt peſts of corn, is produced from bad ſeed of wheat. The French call it *yvraie*; becauſe, put into bread, or beer, it is ſuppoſed to cauſe drunkenneſs. It has always been reckoned bad for the eyes, and to occaſion vertigoes. This plant is very like the red darnel-graſs, which has been ſo much cultivated, under the name of ray-graſs, or vulgarly rie-graſs: but the ſpike is much larger and paler; and has beards, which the ray-graſs is entirely without. It is likewiſe annual: whereas the ray-graſs has an abiding root. Its ſeeds ripen with the corn.

Bearded oat-graſs, or wild oats, is very like the common oat in appearance, but generally over-tops it. The ſeeds are alſo of a duſky reddiſh colour, and hairy towards the bottom. The beards or awns are very long, ſtiff, and bent. As it ripens with the corn, or but little before it, the extirpation of it is not very eaſy.

Baſtard alkanet is called, alſo, baſtard gromill, or gromwell, and falſern. Nothing is more common among the corn, eſpecially among rye, than this weed. It may eaſily be known, by its red roots, which yield a red tincture, and are uſed by the country girls in Sweden, to ſmear their faces with. From the root uſually riſes a ſingle ſtem, about a foot high, rough, and branching out at the top. The flowers are ſmall and white, ſurrounded with five long, narrow, hairy leaves, and ſucceeded by four white rough ſeeds.

The dodder is ſo remarkable a plant, that it cannot be miſtaken by thoſe who know the name. It is entirely without leaves, and does not depend on the ground for nouriſhment; but when it is grown up, rots at the bottom, and lives upon the juices of other plants, about which it entwines itſelf, by means of ſmall threads of a red colour, which it throws out. The flowers are ſmall, and come out in roundiſh heads, or bunches, many of them together, here and there, from the ſtem.

Small corn parſley, though it is very common among corn, does not ſeem to be much known. It is a low branching plant. The branches grow thick together, and are knotted and crooked. The flowers grow thick together after the manner of parſley, &c. and are of a white colour inclining to yellow. The ſeeds are large in proportion to the plant, and are ſet about with little crooked briſtles, which make them adhere to the ſtockings in great plenty, when the ſeeds are ripe, which is about, or a little after harveſt.

The leſſer hemlock, called by Gerard, thin-leafed wild hemlock, is ſo well known under the name of fools parſley, as ſcarce to need a deſcription. However, as it is a matter of conſequence to diſtinguiſh poiſonous plants from thoſe which they reſemble, we may obſerve, that though the leaves reſemble parſley, yet they are much darker on their upper ſurface, but pale and ſhining underneath. The diviſions of the leaves are much ſharper, and they have no ſmell, nor ſcarcely any taſte. When the plant is in flower, it is eaſily known by the three long narrow green leaves, which hang down from the little ſtems that immediately ſupport the flowers.

Shepherd's needle, or Venus's comb, has its names from the remarkable ſhape of the ſeeds with their appendage, reſembling in this reſpect the cranes bills: theſe would be alone ſufficient to diſtinguiſh the plant. They ſucceed ſmall white flowers; and come out in a bunch, like needles, or the teeth of a comb, ſet cloſe together. The leaves are very finely cut.

Knot-graſs is ſo called from its knots or joints, of which its ſlender creeping branches are full. After harveſt, the lands, in many places, ſeem all coloured with the little red flowers of this plant. It is called, alſo, ſwine's-graſs; and, in the north, bird's tongue.

Black bindweed has a ſtem that lays hold on any neighbouring plants, and twines about them from right to left. Its leaves are ſmooth, and ſhaped pretty much like thoſe of the buck-wheat, which its ſeeds alſo reſemble, being triangular, but ſmaller. It frequently ramps up in hedges and gardens, and is alſo very common among corn.

Corn-crowfoot has an upright ſtalk. The leaves are of a pale green, and cut into long, narrow, acute ſegments. The flowers are much ſmaller, and paler than in the crowfoots of the paſtures; but the ſeed-veſſels are the moſt remarkable, for they are covered all over with prickles. This is extremely common among corn.

Charlock, called, alſo, chadlock, catlock, carlock, and wild rape, is, I ſuppoſe, too generally known to need a deſcription. The white and the yellow-flowered charlock, or wild radiſh, which are only varieties of each other, and not ſo common as the former, may eaſily be diſtinguiſhed from it, by the paleneſs of their flowers, and the form of their ſeed-veſſel, which is round, ſmooth, and jointed. Almoſt the whole plant is covered with bent pellucid hairs.

Yellow vetchling, or ſmall yellow fetch, has long, ſlender, divided ſtalks. The leaves are triangular, and grow by pairs cloſe to the ſtalk. Out of theſe leaves comes a tendril, by which the plant ſupports itſelf; and, on a long ſtalk, one ſmall pea flower, of a yellow colour, which is ſucceeded by a flat pod, about an inch in length, containing ſix or ſeven roundiſh ſeeds.

Corn-marigold, or golden corn-flower, is the buddle, or yellow buddle of Kent. Its leaves grow cloſe to the ſtem, in an alternate order. They are of a blue-green colour, and are cut about the edges. The flowers are like thoſe of the marigold; large, and of a beautiful yellow.

Yellow rattle is known by its leaves being finely indented about the edges; its flowers being yellow; and its ſeed-veſſel ſwelling into a dry, large, compreſſed bladder, divided into two cells, and containing ſeveral compreſſed ſeeds, ſurrounded with a membrane.

Red eye-bright, or eye-bright cow-wheat, has a ſtem riſing not more than a foot high; long narrow leaves, indented about the edges, and purple flowers growing in ſpikes. It flowers in July and Auguſt.

Viper's bugloſs. The ſtalks are rough, round, ſolid, erect, undivided, and marked with black ſpots; the leaves are very rough, long, narrowing to a point, and placed without any certain order. The large ſpecious flowers, of a beautiful blue colour, grow in long bending ſpikes. They conſiſt of one petal, divided into five roundiſh ſegments, of different ſizes, and reſemble a horn in their figure, expanding by degrees, from a narrow beginning. The flower-cup conſiſts of five narrow ſegments, and contains four rough ſeeds.

Melilot is well known by its trefoil leaves, which are indented, and, as it were, eaten about the edges; and by its long, thin ſpikes of ſmall, yellow flowers, which are ſucceeded by ſhort rough pods, containing two ſeeds.

Wild carrot, bird's-neſt, or bee's-neſt. Is very like the cultivated carrot, of which it is indeed ſuppoſed to be only a variety. The wild ſort, however, differs in his roots, being ſmall and ſticky. In both ſorts, after they have done flowering, the umbels contract themſelves into the ſhape of a bird's neſt.

Cow parſnep, wild parſnep, meadow parſnep, or madnep. This grows three feet high. The ſtalk is round, furrowed, and hollow. The leaves proceed from a large membrane, or ſheath. They grow on long hairy ſtalks, and are divided and downy. The flowers grow in large umbels, are white, and conſiſt of five irregular petals. Two oval, ſtreaked, compreſſed ſeeds, ſurrounded by a wing, ſucceed each flower.

Stinking hawkweed may be diſcovered by its very ſtrong ſmell like caſtor. As it is not a common weed, it is not neceſſary to be particular in the deſcription of it.

Muſk-thiſtle is known by its handſome purple nodding heads of flowers, which come out rather ſooner than moſt ſorts of thiſtle. The ſmell of them is agreeable.

Carline-thiſtle is very different from the other thiſtles. The hard, woody root, ſends up one round purpliſh ſtalk, beſet with prickly leaves in no order. This is terminated with ſeveral flowers, growing in a head. The ſmall ones, compoſing the whole, are of a duſky purple, and contained in a ſwelling ſcaly cup; the inner ſcales of which are very long, ſhining, coloured, ſpreading, and placed in a ring round the flowers. The ſtalks and heads remain all the year, with very little variation, upon the dry paſtures.

Perennial weeds in corn.

Field fox-tail, ſmall baſtard fox-tail, or mouſe-tail graſs, is known by its long, round, ſlender, ſmooth ſpike, of a duſky purple colour. The ſpikes are ſo very long and ſlender, that they uſually bend a little. This graſs is found in the moiſt furrows of arable land, and in any places where the water is ſuffered to ſtand.

Common wheat-graſs, or couch-graſs, is univerſally known, by its long white creeping roots. It grows very tall, eſpecially in hedges. The ſpike reſembles that of wheat, in the manner in which the ſeeds are diſpoſed.

Common field ſcabious is all over rough and hairy. The ſtalk is upright; a foot, or a foot and a half in height, ſpotted, and branching. The lower leaves are oval, and indented about the edge. Thoſe which grow on the ſtalk are divided, and of that ſort which botaniſts call pinnatifid. The flowers are blue, of the compound kind; conſiſting of a conſiderable number of ſmall flowers, each divided into four parts, and having one ſeed under them. The taſte of the plant is a diſagreeable bitter.

Small bindweed, called, alſo, with-wind and hedgebells, though theſe names ſhould ſeem rather to belong to the great bindweed, which ramps in the hedges; whereas this overſpeads the arable lands. The common people, in their wrath, have given this pernicious weed the ſame opprobrious names with the dodder, viz. hell-weed, and devil's guts.

The ſtalks of this plant are weak, and twine about any thing. They come near, from left to right; and, when they find no ſupport, they trail along the ground. The leaves come out ſingle. They are three cornered, ſhaped ſomewhat like an arrow head, ſmooth, and placed on long foot-ſtalks. From the boſoms of the leaves comes out one flower on a very long foot-ſtalk. It is bell-ſhaped, of a beautiful colour, purple, red, white, or variegated; and is ſucceeded by a ſmall, roundiſh ſeed veſſel, containing four large, angular ſeeds. The whole plant is full of a milky juice.

Bladder-campion, white-corn campion, ſpattling poppy, white bottle, white ben, or frothy poppy. The ſtalks grow a foot and a half, or two feet high, round, ſmooth, jointed, branched towards the top; and at every joint is a pair of leaves, perfectly ſmooth. The flowers are white, and conſiſt of five bifid petals. The empalement, or outward covering, is puffed out into a roundiſh form; and is ſmooth, often varied with red, green, and white, and beautifully veined all over, like a fine net.

White campion, admitted into gardens, when it has a double flower, under the name of white batchelor's-buttons. It has a long and large root, of a ſharp bitteriſh taſte, ſending forth ſeveral ſtalks about two feet high; round, hairy, jointed, branching, of a red colour near the ground; a pair of leaves comes out at every joint, hairy, and ſharp-pointed. The flowers are like thoſe of the laſt: but the empalement, which is not puffed out like that, is oblong, with purpliſh ſtreaks down along it from top to bottom. The flowers of this are imperfect: the male or barren, and the female or fruitful, growing on diſtinct plants.

Small bramble, or dewberry-buſh, is diſtinguiſhed from the common bramble of the hedges, by the place of its growth, the trailing of its round branches, the ſmallneſs of its prickles, which are fewer in number, and chiefly on the ſtalks; the leaves growing only three together, being green underneath, and the ſide ones divided into two parts; and the blueneſs of its berries, which conſiſt of a very few large diviſions.

Corn-mint. We are told, on undoubted authority, that this herb will hinder milk from curdling; and that, when hungry cows have been put after harveſt into a field where this plant abounded, it has been ſcarcely poſſible to turn their milk for cheeſe.

Corn reſt-harrow, reſt-plough, cammock, petty whin, or ground furze. The hard, ſtubborn, creeping roots ſend forth many woody, round, ſlender, hairy branches, red towards the bottom. The leaves grow three together. The flowers of the pea kind, of a beautiful red colour, and are ſucceeded by a ſwelling, villous pod, containing a few roundiſh ſeeds.

Tree ſowthiſtle. The root is very creeping, full of milk, and with difficulty eradicated. The ſtalk is about two feet high, ſmooth at the bottom, but hairy where it begins to branch out. The leaves are like thoſe of the dandelion, deeply cut, ending in ſharp points, and having the edges ſet round with tender prickles. The flowers grow ſeveral together; and reſemble thoſe of the ſow-thiſtle, but are much larger, of a deeper yellow, and ſurrounded by a very rough, hairy, dark-coloured empalement. They have the ſmell of bitter almonds, and are ſucceeded by downy ſeeds.

Great knapweed, matfellon, or bulweed. This plant is about two feet high. The ſtalks are round, ſtreaked, and hoary. The bottom leaves are oblong and undivided; but thoſe, which grow on the ſtalk, are cut and divided. The flowers reſemble thoſe of the blue-bottle in ſhape, but are of a red colour. The ſeed is ſmall, oblong, reddiſh, and hairy in the upper part.

Corn horſe-tail grows in moiſt places. In April, naked ſtalks come up, which bear the flower and ſeed. Theſe are but of ſhort duration. In May, other ſtalks ariſe, hollow, jointed, about a foot high, and ſending forth all round, hollow jointed leaves, ſix or eight inches in length, ſubdividing into others at the joints.

Perennial weeds in paſtures.

Devil's bit is a kind of ſcabious. It differs from the common field ſcabious, in having undivided leaves, ſet thicker on the ſtalk; in the flowers not ſpreading out into a flat ſurface, but growing in a round form; and the ſmall flowers, which compoſe the whole, being all of a ſize and regular: and, laſtly, in the root looking, as if it were bit off at the end.

Great plantain, or waybread, is eaſily known by its broad leaves, ſpreading on the ground, and marked on the under ſurface with ſeven ſtrong nerves. From the centre of theſe ariſe ſeveral naked, round, hairy ſtalks, ſuſtaining a long, cylindrical ſpike of ſmall flowers, ſet thick together.

Rib-wort plantain has much longer leaves, marked only with five nerves. The ſtalks are higher, and not round, but cornered, and the ſpikes of flowers are ſhorter.

Yellow ladies bedſtraw, cheeſerenning, maid's hair, petty mugwet. Its ſlender ſtalks riſe to about a foot. The leaves come out in whorls, eight or nine together. They are long and narrow, and of a deep green. Towards the top of the ſtalk, two little branches uſually come out, ſuſtaining a conſiderable number of ſmall yellow flowers, conſiſting of one petal, divided into four parts, and ſucceeded by two ſmooth roundiſh ſeeds.

Round-leaved bell-flower. The bottom leaves are roundiſh: thoſe upon the ſtalk long, and narrow. The flowers are blue, bell-ſhaped, with the edge divided into five parts, and hang down.

Leſſer throatwort, or Canterbury bells. The ſtalk is cornered and undivided, about a foot high, and hairy. The flowers grow at the top of the ſtalk cloſe to it, ſeveral together. They are erect, of a beautiful purple colour, and divided to the middle into five acute ſegments.

Meadow ſaxifrage, Engliſh ſaxifrage, or ſtone-break. The root has a ſharpiſh, aromatic taſte. The ſtalks are round, ſtreaked, and reddiſh towards the bottom. The leaves are ſmooth, of a dark green, and divided twice into long, narrow, ſharp ſegments. The foot-ſtalks membranaceous at the baſe. The flowers grow in looſe umbels, and are of a pale yellow. The ſeeds are oval, ſtreaked, and red at the top.

Burnet ſaxifrage is of two kinds. The large is found in woods; and the ſmaller, in dry paſtures. Of this laſt there is a variety, differing only in the leaves, which are cut even to the root. The ſtalks are ſtreaked, and branching. The flowers grow in umbels cloſe together. They are ſmall, white, and conſiſt of five entire petals. Theſe are ſucceeded by two ſeeds of an oblong oval form. The root has a very hot taſte.

Crow garlick, or wild garlick. The leaves are round and ſmooth, reſembling much thoſe of ruſhes. From the midſt of theſe riſes a ſtalk, a foot or more in heighth, naked, ſlender, round, ſmooth, and hard; ſuſtaining many purple ſeeds, or little bulbs, about the ſize of grains of wheat collected into a round head.

White ſaxifrage, ſengreen, or ſtone-break, has kidney-ſhaped leaves ſpread upon the ground, and divided about the edges, not much unlike thoſe of ground-ivy, but ſofter and ſmaller, and of a faint yellowiſh green. Among theſe riſes a round, hairy, branching ſtalk, about ſix inches high, bearing ſpacious white flowers, conſiſting of five entire petals. This pretty little plant grows in dry paſtures, and may readily be known by its roots, which are made up of little knobs.

From a want of ſufficient diſtinction in names, a ſtrange confuſion has ariſen between the meadow ſaxifrage, Burnet ſaxifrage, Burnet, and white ſaxifrage. It is hoped theſe deſcriptions will contribute ſomething towards avoiding this confuſion for the future.

Agrimony has generally a ſingle, round, rough ſtalk, with leaves placed alternately upon it, which are winged with ſmall leaves, placed between the larger pairs. The yellow flowers grow alternately along the ſtalk, in a long row, after the manner of a ſpike, and are ſucceeded by rough ſeeds.

Dropwort is known by its winged leaves, the diviſions of which are all regular, and ſharply indented about the edges; by its white flowers, growing in a bunch like an umble: but, principally, by its roots, which conſiſt of a bunch of knobs hanging upon threads, from whence it has the names of filipendula, and dropwort. The flowers ſmell agreeably.

Meadow-ſweet, or queen of the meadows. The ſtalk is angular, ſmooth, ſtrong, branching, and of a reddiſh colour. The leaves grow alternately, are winged, and conſiſt of three or four pair of lobes, and a very large one at the end, divided into three parts, like a raſberry-leaf. They are indented about the edges, white underneath, and wrinkled, like the leaf of the elm. The flowers are ſimilar to thoſe of the dropwort. The whole plant has an agreeable ſmell.

Tormentil, or ſeptfoil. The root is large, of a reddiſh colour, and an aſtringent taſte. The ſtalks are weak, and lie on the ground at firſt; but afterwards riſe up. The leaves are hairy, grow cloſe to the ſtalk, and are divided into ſeven parts. The flowers are yellow, and conſiſt of four petals. There is another ſpecies, not ſo common, differing from this only in having its ſtalks lying intirely on the ground, and the leaves growing on foot-ſtalks.

The crowfoots are too common every where to need a deſcription. They are known under the names of kingkob, king cup, gold-cups, gold knobs, butter-cups, and butter-flowers. The bulboſe crowfoot is diſtinguiſhed not only by its round root, but by the diviſions of the flower-cups being bent back, the ſtalk being erect, and that which ſuſtains the flowers being furrowed. The upright crowfoot has the diviſions of the empalement ſpreading out, as in the creeping ſort; but the flower-ſtalks are not furrowed, as in that and the bulboſe one. The leaves are divided, firſt, into three parts; and each of thoſe again into ſeveral. The upper leaves are long, narrow, and undivided. This plant grows much taller than the others. The flowers of all three are alike, and of a fine ſhining yellow.

Pilewort, figwort, or leſſer celandine. The root conſiſts of oblong knobs. The leaves are heart-ſhaped, cornered, and placed on foot-ſtalks. The flowers reſemble in general thoſe of the crowfoots, but differs ſomewhat from them in having the cup divided only into three parts, the petals being about eight in number, and narrower. This low plant runs very much at the root, and choaks all plants which are near it.

Bugle, middle confound, ſicklewort, or herb carpenter. It riſes about half a foot high, with a ſquare ſtalk. The leaves come out by pairs, of a purpliſh colour, and indented about the edges. The flowers grow in a ſpike, are blue, and have a very ſmall upper lip.

Self-heal, hook-heal, ficklewort, carpenter's herb, or prunell. This differs from bugle, in the leaves being longer and narrower: and in the flowers growing in a thicker fpike; their upper lip being larger, and their filaments being forked.

Common yellow toad-flax, or flax-weed. It creeps very much with its hard woody roots: which fend up feveral fmooth ftalks, a foot, or a foot and a half high, covered with long, narrow leaves, placed without order. The flowers grow in clofe fpikes, on fhort foot-ftalks, at the top of the ftalks. They are of a light yellow, fhaped like a calf's mouth; and end in a fpur behind.

Ladies-fmock, cuckow-flower; in Norfolk, Canterbury-bells. The ftalk is upright, round, and fmooth. The leaves are winged, with the lobes of the lower ones roundifh; and of thofe upon the ftalk oblong. The flowers are large, handfome, and white, or purplifh; confifting of four obtufe veined petals. The feeds are contained in erect, compreffed pods, an inch, or an inch and a half long; divided into two cells: which, when ripe, burft with a touch, and throw out their feeds to a confiderable diftance.

Crow-foot crane's-bill, or blue crane's-bill. The leaves are divided, almoft to the middle, ufually into feven parts. The ftalk commonly divides into two branches, and each of thefe into two more. From the corner of each divifion, comes a flower-ftalk; fupporting two large blue flowers; confifting of five roundifh, intire petals, fucceeded by a long feed-veffel, refembling a crane's-bill. This bill-like feed-veffel is thick and rough; but not fo long, as in fome of the other forts.

Reft harrow, or cammock, of the paftures, differs very little from the corn reft-harrow defcribed before. The branches of this are armed with long ftiff prickles. The flowers are of a higher purple, and come out fingle: whereas, in the other, they come out two together.

Dandelion, or pifs-a-bed, is well known in all paftures, by its milkinefs, and its naked, hollow ftalks, fupporting one large, yellow, compound flower; which is fucceeded by a round ball of downy feeds.

Rough dandelion, or dandelion hawkweed. The whole plant is rough, with forked hairs. The flower-cup does not bend back, as in the common dandelion: and this is a taller plant.

Yellow devil's-bit, fo called, becaufe the end of the root feems as if it were bit off, is alfo known by the name of fmall hare's hawkweed. The leaves are fmooth, long, narrow, and cut into long, fharp-pointed fegments. The ftalks are a foot and a half, or two feet high, and branching. On the tops of thefe, grow many flowers, fmaller and paler than in the dandelion; fupported on fcaly flower-ftalks.

Long-rooted hawkweed. This has a very long tap root. The ftalks are a foot and a half high, or more; cornered, naked, and divided. The bottom leaves fpread in a circle on the ground, and are jagged and rough. The flower-ftalks are fcaly. The flowers, and down of the feed, refemble thofe of the dandelion.

Dwarf, or fmall purple carline-thiftle. This lowly plant fpreads its prickly leaves a foot round, and fuffers nothing to grow beneath them. Its purple flower comes out in the midft of thefe, without any ftalk, clofe to the ground.

Colt's foot, fole-foot, horfe-hoof, or bull-foot. In February, the fcaly ftalks arife, bearing one yellow compound flower; which is fucceeded by a hairy white down. The leaves come out later. They are fhaped fomewhat like a horfe's hoof; and are downy underneath.

Butter-bur, or peftilent-wart, refembles colts-foot in many refpects: but the flowers are purple, and grow in a thyrfe. The leaves come out after the flowers decay; and are like thofe of the colt's foot in fhape; but are three or four times as big.

Ragwort, ragweed, ftaggerwort, ftanerwort, St. James's wort, feggrum, or feagrim. The ftalk is ufually fingle, round, ftreaked, folid, and of a purplifh colour, in fame parts. The leaves are very much jagged, fmooth, and of a dark green. The flowers are yellow, radiated, and grow many together. When we affirmed, that this plant comes up eafily by hand, when young, or the ground is moift; we fpoke from experience. The fact, in few words, was this. Some clofes were notorioufly over-run with this weed. The owner, juft before the time of flowering, and after fome rain, turned in a man and woman upon them; ordering the woman to pull up all fhe could by hand; and the man to root out the reft, with his docking-iron. The rag-wort was not, indeed, left in a lane, for the downy feeds to ripen; and to be carried on again to the clofes, by the wind: but the plant was thrown in heaps, and burnt, and the afhes were fpread upon the grafs. It was not, indeed, all deftroyed at this firft attempt; but the few plants, which came up, the following year, were foon pulled up by the woman; and fcarce a plant has now appeared in thefe clofes, for feveral years paft.

Fleabane, middle fleabane, or fleawort. The ftalk is round, bending, folid, and hoary. The leaves are oblong, fharp-pointed, wrinkled, downy, and embrace the ftalk, on which they grow, very thick, without regularity. The flowers are yellow, radiated, and inclofed in a flower-cup, made up of narrow fcales like briftles. Mr. Ray tells us, that, if the leaves or tops of fleabane be fqueezed, they fmell like foap. Gerard fays, the herb-women call it herb Chriftopher.

Greater daifie, ox-eye, or maudlin-wort. The ftalk is five-cornered, folid, and branching. The leaves are jagged; and embrace the ftalk. The flowers are large, and radiated. The ray is white; and the difk yellow: the feeds have no down.

Common yarrow, milfoil, or nofebleed. The ftalks are flender, round, ftreaked, ftiff, and hairy. They are divided towards the top into feveral branches; and thefe again into flower-ftalks; fupporting fmall white or purplifh flowers; growing thick together in a kind of umbel. The leaves are cut very fine; and divide twice.

Common, or black knapweed, matfellon, black matfellon, or bulweed. The root is hard, thick and woody; and has a difagreeable aftringency. The ftalks are round, rough, ftreaked, ftrong, and very tough. The leaves are irregularly placed, oblong, and of a dark green. From the wings of the leaves, arife ftalks, fupporting one, two, or three heads of flowers; which are purple, and inclofed in a fcaly cup. The fcales are black, and furrounded with fine hairs, like the eye-lafhes.

The orchifes may be known by their roots; which are either a double bulb, refembling a pair of tefticles; or a bunch of long flefhy roots, like the fingers of the hand. The flowers, by growing in a fpike, make a handfome appearance. The colour is red in moft forts.

Adder's-tongue is hid among the grafs in low meadows. From a very low ftalk, arifes a fingle, thick, fmooth, oblong leaf; from the bofom of which, iffues a kind of tongue, ending in a point, and indented on each fide like a file.

WEEVIL, an infect of the beetle kind, refembling a fmall May-bug, with a long fharp pointed head, to the hinder part of which are fixed two antennæ. It is black, and therefore eafily diftinguifhed in any corn: but its principal and favourite food is wheat, of which, either old or new, it devours great quantities; without, however, communicating any bad fmell to it, as the moth does. Some call it the corn-loufe, becaufe it bites animals more ftrongly than fleas do. This has made it to be looked upon as a carnivorous infect; and many have pretended that it devours both the worm and the chryfalis of the falfe moth: an opinion which M. Duhamel does not think improbable, becaufe, in effect, very few of thofe moths are ever found in corn where there are many weevils.

Upon thrufting one's hand into a heap of corn, one may eafily perceive, by its heat, whether it contains many of thefe infects, which generally lie pretty much collected; and the particular places where they are moft numerous, feel much warmer than the reft. This obfervation foon led M. Duhamel to think, that a confiderable heat is probably neceffary for the hatching of their eggs; and that, in this cafe, even if they fhould live, they will not be able to breed, in his ventilating granaries.

To afcertain this fact, he put fome weevils into wheat (not ftove-dried) in one of thofe granaries, in May 1751. It was well ventilated from time to time, and opened in Auguft 1752, when none of them were found. He did the fame ſame with wheat which had been ſtove-dried; and when the granary was emptied, a year and half or two years after, not a weevil could be ſeen.

He again put ſome weevils into a ventilating granary in which wheat of the year 1754 was laid up, without having been ſtove dried. This corn was taken out in May 1756, and ſifted over a fine ſcreen; which gave him an opportunity to obſerve whether the weevils had increaſed. Their number ſeemed to him nearly the ſame as that he had put in: and a farther reaſon which induced him to think they had not multiplied, was, that this grain, inſtead of being heated, as corn is well known to be whenever weevils breed in it, was ſo cool, that a country fellow employed for this work could hardly remain bare-footed among it.

In 1755, Dom Edward Provenchere, procurator of the Carthuſians of Liget, near Loches, in the province of Touraine, intending to make ſome experiments on the preſervation of corn, choſe for that purpoſe a large caſk, at one end of which a little above the common bottom, he put a floor of lattice work, and over that a canvas. This caſk was filled with wheat of the harveſt of 1754, of which it contained 1080 pounds. He then fixed to it a pair of middle ſized bellows, ſo ſituated that they might eaſily be worked; and nearly in the centre of this corn, he put as many weevils as weighed ſix drachms; which is pretty conſiderable for that quantity of grain.

The bellows were blown an hour every week. In the beginning of September 1756, when that operation had been neglected for ſome time, the corn began to heat: but it was ſoon cooled again by uſing the bellows. The 15th of October, on taking the corn out of this caſk, in which it had kept perfectly well, not above twenty weevils were found in it. Dom Edward ſays he ſaw that inſect come out of the vent-holes every time the bellows were blown. He perceived in many places ſeveral grains of corn linked together by threads, certainly formed by moths that were in his wheat (which had not been ſtove-dried), and, not dying immediately, had had time to ſpin their web.

Dom Edward filled another caſk with nine hundred pounds of barley, not ſtove-dried, and put into it ſix drachms of weevils. Though care was taken to ventilate this caſk as much as the former which was filled with wheat, that is to ſay, during an hour every week, yet this corn heated prodigiouſly: the bellows could not cool it, and the weevils multiplied in it exceedingly.

"This, ſays M. Duhamel, is the very thing that happened to me in my larger experiment on the ſame kind of grain. Barley probably contains a great deal of moiſture; and the queſtion is whether ſtove-drying can be able to preſerve it. The increaſe of the weevils here ſeems to prove, that this inſect cannot multiply in corn which retains a proper degree of coolneſs."

Though the above experiments ſeem to prove pretty clearly, at leaſt that the weevil cannot breed in corn which is kept properly cool, and that if any ſure way to deſtroy this inſect be ever diſcovered, it will be moſt likely to ſucceed by means of the ventilating granary; yet M. Duhamel, with his conſtant candour and unvaried zeal for the welfare of mankind, exhorts the naturaliſt, the philoſopher, the lover of the public good, not to rely too much on any thing that he has ſaid in this reſpect; to look upon the trials which he has related, as ſteps only which may help to lead to that deſired end; and to continue their endeavours to render to the world the important ſervice of ſhewing how this creature may be effectually exterminated, by any ſafe and practicable method.

"I have tried, continues he, in his lateſt writings upon agriculture, many of the receipts moſt vaunted in books of huſbandry, as remedies againſt the weevil, and have not found the leaſt benefit from any one of them. All that they have taught me, is that this animal will endure a great deal before it can be killed. It will live a long time without eating: cold will benumb it ſo as to make it appear to be dead; but I have put ſome of them, in that ſtate, into a warm place, and after keeping them there for ſome time, have found that they were perfectly alive: the great coolneſs of my granaries has ſeemed to prevent their increaſe; but it has not killed them. They bear eaſily a heat of from forty-five to fifty degrees of Réaumur's thermometer (from one hundred and fifteen to one hundred and twenty-four of Farenheit's). I kept corn in which there were many weevils, during half an hour, in a place heated to upwards of eighty degrees of Réaumur's thermometer (two hundred and ten of Farenheit's): ſome of them periſhed; but others remained alive. They, therefore, who would deſtroy them by ſuch a degree of heat, muſt let their corn be expoſed to it during ſeven or eight hours at leaſt.

"I grant that the ſmoke of ſulphur will kill any inſect; but that method is not practicable in granaries: for this vapour, which is very light, aſcends to the top of the granary, and ſcarcely acts at all upon the corn on the floor. It is true, that the corn may be ſo diſpoſed as to let this ſmoke paſs through it, and all the inſects in it will then be deſtroyed. But, at the ſame time, this ſmoke will give the corn a very diſagreeable and laſting ſmell, which depreciates it entirely. Conſequently this method will not do.

"It is confidently ſaid, that the weevils may be driven away by turning the corn with ſhovels rubbed with eſſence of turpentine. To try whether this eſſence really diſpleaſes them, I ordered two large caſes to be made: the inſide of one of them was rubbed with eſſence of turpentine; both of them were filled with corn in which there were many weevils; and the inſects remained as quiet in the one as in the other. It is true, that when corn infeſted with weevils is turned with a ſhovel, ſeveral of thoſe inſects quit the heap, and haſten towards the walls of the granary. This may have been imputed to the rubbing of the ſhovel with oil of ſpikenard or eſſence of turpentine: but the ſame thing happens when the ſhovel has not been rubbed with any drug whatever; and the fugitive weevils ſoon return to the heap of corn.

"When corn is ſifted in a ſieve (and the ſame is applicable to a ſcreen) fine enough to retain the grain; the weevils, then agitated, ſhrink up their legs, and are, in that poſture, generally ſo much ſmaller than the good corn, that very many of them drop through the ſieve. The greateſt part of them may therefore be deſtroyed by this method, which is a very good one: but, unfortunately, there will ſtill remain enough of them among the corn, to do conſiderable damage. This ſieve or ſcreen ſhould be of wire; and under it ſhould be placed an earthen or copper veſſel, pretty deep, to receive the inſects, and ſmooth on its inſide, to prevent their getting out eaſily.

"Of all the methods I have tried, that which has ſeemed to me to be the beſt, is to dry the corn in a ſtove, or oven, heated to eighty or ninety degrees of M. de Réaumur's thermometer (from two hundred and ten to two hundred and thirty of Farenheit's) and to let it remain there twelve hours. I exhort all thoſe who wiſh the welfare of the public, to ſtudy the means of deſtroying the weevil, and, in conſequence thereof, to make particular experiments: but I beſeech them not to publiſh their diſcoveries till they have made repeated trials of them, and that in different granaries: for I have ſometimes ſeen theſe inſects forſake a granary, when no cauſe could poſſibly be aſſigned for their ſo doing."

WELD, *or* DYER'S WEED, the name of a plant much uſed by the dyers to give a yellow colour to woollens, ſilks, cotton, and thread.

Its root, which is compoſed of a few ligneous fibres, does not pierce deep: from this root it puts forth leaves about four inches long and half an inch broad, of a lively green, ſoft to the touch, and ſpread circularly near the ground, with ſome gentle wavings at their edges, but obtuſe at their points. Its ſtem, which riſes from amidſt theſe leaves to the height of three feet, or even more if the ſoil and culture be very good, often branches out, and is garniſhed with leaves like thoſe below, though ſmaller in proportion as they approach the flowers, which grow in long looſe ſpikes at the end of the branches or ſtem. Theſe flowers, which appear at the latter end of June, are each of them compoſed of three ſmall irregular petals of a greeniſh yellow, to which ſucceeds a globular berry of the ſame colour, terminated by three points, and in which are incloſed ſmall brown ſpherical ſeeds. Theſe ſeeds ripen in September. The plant becomes entirely yellow when it is dry, and the whole of it, but eſpecially the berry, is uſed in dying. The ſlendereſt weld, and particularly if it inclines to a ruſſet colour, is accounted the beſt: that

that which is larger, and of a dull green, is much less esteemed.

This plant grows naturally along the sides of high-ways, upon dry banks, and on old walls, in many parts of England, France, Spain, and other countries where the winters are not very severe: but the cultivated sort is far preferable to the wild, both for the quantity and the goodness of the colour which it yields. It will thrive tolerably on almost any soil, provided it be dry and warm: but the richer the land is upon which it is sown, the greater will be the produce; and in proportion to the care with which it is cultivated, the more vigorous and fit for dying will it be.

The ground for this, as for every other plant, should be in fine tilth at the time of sowing it; though here, unless it be very poor indeed, it will not require dung. The seed should be that of the preceding year; for if it be older, great part of it will not grow. Both Mr. Worlidge and M. Du Hamel are of opinion that weld-seed should, on account of its smallness, for it is but little bigger than that of purslane, be mixed with ashes, buckwheat, oats, or some other similar ingredient, in order the better to avoid sowing it too thick; for the plants of weld thrive best when they are about six inches asunder. For this reason, as was before observed in regard to all plants which require being hoed, it is best to sow weld in rows. Some sow it on barley, or oats after they have been sown and harrowed, this requiring only a bush to be drawn over it; for it should not be covered deep. A gallon of weld-seed thus used in the broad-cast way will be sufficient to sow an acre of land. It will not grow much during the first summer, when it is thus sown; but it will thrive apace after the corn is taken off.

The beginning or middle of August is a proper season for sowing weld in this country. The only care that it requires whilst growing, is to keep it clear of weeds which might choak it, or at least weaken its growth.

The French, in general, sow their weld in March, and pull it up in July or August of the ensuing year, when part of its seeds are ripe, and the plant is still of a greenish yellow: they then dry it and thresh it upon cloths, to get the ripest of the seed, and after this they tie the stalks up in bundles, and sell them to the dyers. But Mr. Miller rightly judges, that the best time to pull the weld for use is when it begins to flower, that is to say, about the latter end of June, because, like all other vegetables, it is then in its greatest vigour, and consequently best fitted to yield the greatest quantity of dye. For a produce of new seeds, it is much better to sow a small piece of land on purpose, or to set apart for this end a suitable portion of the field of which the plants are intended for use, rather than let the whole stand too long, that is to say, till part of the seeds are ripe; because, by letting the plants stand till then, their quality is injured far beyond the value of the seeds that are got from them (the berries being, as was observed before, the part which yields the finest dye); and besides, the seeds thus obtained will of course be a mixture of ripe and half-ripe ones, on the growing of which there cannot be a due reliance. The common way of drying these plants is to set them upright in small handfuls in the field, and when they are dry, to tie them up in bundles. They must also be housed dry; and care must be taken to stack them so loosely that there may be room for the air to pass between them, to prevent their fermenting.

The plants which are intended for seed should be pulled as soon as their seeds are ripe, and then be dried and beaten out for use: for if this is deferred, or if they are let stand too long, the seeds will scatter.

The method of cultivating this plant at Oissel, in Normandy, where great quantities of it are raised for exportation to Holland, independent of the consumption in France, is thus related by M. Dambourney, in the Memoirs of the Royal Society of Agriculture at Rouen.

"In the month of July, just after the kidney beans then in bloom have been hoed for the second time, and earthed up, especially if there be an appearance of approaching rain, weld-seed is sown among them, very thin, as equally as possible. Careful husbandmen bury this seed by dragging over it a small bush of thorns. Whilst the weld rises, the beans ripen and are gathered; after which the ground remains, of course, planted with weld only. This is hoed about Michaelmas, then left in that condition during the winter, and in the ensuing month of March, when the danger of frosts is judged to be over, it is hoed again, to extirpate such weeds as may have come up in the mean time. Towards the end of June in this second year, when the weld has done blossoming, when its berries form, and when the plant begins to turn yellow, advantage is taken of the first fair day after a rainy one, to pull it up. Two men will then pull up as much of it in one day, as four men can when the ground is dry and hard. It is carried off in large bundles: but these are untied before the weld is laid up for keeping, and the plants are spread out and set upright against walls or hedges well exposed to the sun, the heat of which completes their drying in two days. They are then laid upon a cloth, to prevent the loss of the seed, which drops very easily out of the now open capsules; and finally, after being tied up again in bundles weighing about thirty pounds apiece, they are piled up loosely in a barn or other well covered place, where they complete their ripening, and generally shrink to less than half of their former weight.

"Weld raised on rich ground is apt to be greasy and too full of stalks: that which grows in sandy places is of a better quality, and has only one main stem: but, in return, the produce here is much less than in the former case.

"As soon as the weld has been pulled, sheep are turned in upon the land, to eat up the grass it may have produced: it is then plowed once; and after another plowing at the end of October, it is sowed with wheat, or great rye, without using any other compost or dung. If the land is light and destined for spring-corn, turnips may be sown upon the first plowing after the weld; for they will have time to grow big enough to be pulled before the plowing for oats or small rye, which last crops it will be proper to help with a little shavings or raspings of horn.

"If it be intended to raise weld after peas, the ground should be plowed, and the seed sown very thin: to do which the more effectually, this seed, like that of turnips, should be taken up only in pinches between the middle finger and the thumb, and the fore-finger should remain extended, the better to help its spreading when it is dropped. This seed should be sown in rows sufficiently distant for the plants to have full room to grow; and the best way is to leave an alley after every third row. When sown, it is harrowed in, and the only farther care that the weld requires it to keep the plants free from weeds, by hoeing the ground at Michaelmas and in March, as before directed.

"The weld which is sown after peas does not injure the land it grows on; and therefore in this case, as after the kidney-beans before spoken of, wheat may be sown in October, without any previous manure."

WHEAT, the name of a well known plant, greatly cultivated in many parts of the world, especially in England.

As a crop of wheat, is, in general, the principal riches of farmers whose farms consist of arable land, we shall be very full in describing every method yet practised with success, for cultivating this useful species of grain; and in order to this, shall begin with the method of preparing the soil by ploughing, harrowing, and rolling.

Ploughing increases the food of plants, by opening the soil to receive the vegetable food from the air; and by enlarging the surface, and thereby exposing a greater quantity of the soil to its influence.

Ploughing enlarges the pasture of plants, by opening the soil, if too solid, and making it firm, if too light.

Ploughing prepares the vegetable food for entering the roots of plants, by reducing vegetables to a state of corruption, and dissolving oils.

Ploughing destroys weeds, by making their seed vegetate, and then tearing up the young plants; and by exposing their roots to the drought.

Ploughing removes wetness, by laying up land in proper ridges.

It may be said, therefore, that ploughing is one of the most important operations in agriculture; and that the greatest care is to be taken in the performance of it.

Though ploughing in general serves all the purposes mention d, yet commonly one of them only is chiefly in

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view; and according to the deſign in view the work is to be performed.

When the deſign of ploughing is to increaſe the food of plants, the ſurface cannot be made too uneven; for the more uneven that the ſurface is made, the greater quantity of the ſoil is expoſed to the influence of the air, and the greater quantity of food procured.

When the deſign of ploughing is to enlarge the paſture of plants, that kind is beſt that goes deepeſt, (provided the ſoil allows,) and moſt effectually breaks the mold; for the deeper that the plough goes, the greater quantity of ſoil is employed in vegetation; and the more effectually that the mold is broken, the larger is the paſture in the ſame quantity.

When the deſign of ploughing is to deſtroy root-weeds, the ſurface cannot be left too rough, nor the earth of the furrow raiſed in too large pieces; for the rougher that the ſurface is, and the larger the pieces of earth raiſed, the drought has the eaſier acceſs, and more effectually operates in the deſtruction of the roots.

When the deſign of ploughing is to deſtroy ſeed-weeds, the ſurface cannot be made too ſmooth, nor the mold too much broken: for the ſmoother that the ſurface is made, and more effectually that the mold is broken, the ſeeds are the more expoſed to the influence of the air, the ſap better preſerved, and their vegetation the more encouraged.

When the deſign of ploughing is to remove wetneſs, the land muſt be laid up in high and narrow ridges; for the greater number that there are of furrows, there are the greater number of drains; and the higher that the ridges are, the more eaſily the water finds its way to the furrows.

Thus we ſee how this operation of ploughing is to be performed, according to the chief deſign in view. It often happens, however, that land is in ſuch a condition as to require more than one of theſe advantages which ploughing is intended to promote. Theſe are ſometimes conſiſtent with each other, and the land may be ploughed in ſuch a manner as beſt to promote all of them. Thus land is ſometimes, at the ſame time, poor, and wet, and full of root-weeds: now, it may be ploughed in ſuch a manner as is moſt proper for increaſing its food, removing its wetneſs, and deſtroying its weeds: for, by one ploughing, its ſurface may be made uneven, which fits it for receiving an increaſe of food; it may be formed into narrow and ſteep ridges, which beſt removes its wetneſs; and the earth may be raiſed in large pieces, which beſt expoſes the roots of the weeds to be deſtroyed by the drought.

At other times the land is in ſuch a ſituation, that the advantages which it requires from ploughing are inconſiſtent with each other, and it cannot be ploughed in ſuch a manner as is moſt proper for promoting all of them. Thus land, at the ſame time, may be full both of ſeed-weeds and of root-weeds: now, it cannot be ploughed in ſuch a manner as is moſt proper to deſtroy both; for by one ploughing it cannot be raiſed in pieces and left rough, which is neceſſary to deſtroy root-weeds, and have the mold broke and be made ſmooth, which is neceſſary to deſtroy ſeed-weeds. This makes it neceſſary to have one of theſe things chiefly in view at firſt, and to conſider which of the two it is proper to begin with, and how the work may be performed in ſuch a manner, as the other may moſt eaſily ſucceed. Thus, in the preſent caſe, the land ſhould be ploughed, ſo as to be raiſed in pieces, and to be left rough; and in that condition it ſhould be allowed to lie, till the drought may be ſuppoſed to have deſtroyed the roots; and then it may be reduced, the pieces broke, and the ſurface made ſmooth, in order to deſtroy the ſeeds.

In ploughing there are ſome general rules to be obſerved, whatever is the deſign of it. Thus land is never to be ploughed when it is wet. When land is ploughed wet, the deſign of ploughing, whatever it may be, is fruſtrated; and this holds true in every kind of ſoil.

When ſtiff ſoil is ploughed wet, by drying too ſuddenly it becomes ſo hard, that it can receive no benefit from the air, and the paſture in it is entirely ſhut up: root-weeds ſtrike root again before the drought reaches them; and if there are any ſeed-weeds, the ſurface cruſts ſo ſoon, that they are prevented from vegetating.

When light ſoil is ploughed wet, though it may receive ſome benefit by expoſing a larger ſurface to the influence of the air, yet its pores, being full of water, will prevent its paſture from being enlarged; and the root-weeds that are in it, will not be deſtroyed; they will rather flouriſh, by being tranſplanted into a new paſture. In both kinds of ſoil the labour is very ſevere upon the cattle, and the land is greatly damaged by their going upon it, and treading it down with their feet.

Thus it is alſo to be obſerved, that whatever is the deſign of ploughing, the quantity of firm land taken off from the ſurface of the plough in going, ought not to exceed the wideneſs of the furrow which the plough makes below. If it does, the land is not clean ploughed; it is only ſcratched, and a quantity of the ſoil is left below untouched betwixt every furrow that the plough makes.

The quantity of firm land to be taken off by the plough, depends upon the deſign of ploughing, and the nature of the ſoil.

When the deſign of ploughing is to increaſe the food of plants, and deſtroy root-weeds, whether the ſoil is ſtiff or light, as great a quantity may be taken off as the plough can take conveniently; becauſe the greater that the quantity is which the plough takes off, the rougher and more uneven the ſurface is made, the more food is procured, and the root-weeds more effectually deſtroyed.

When the deſign of ploughing is to enlarge the paſture of plants, and deſtroy ſeed-weeds, though a large quantity may be taken off in light ſoil, that naturally falls in pieces when turned over, yet a ſmall quantity ought to be taken off in ſtiff land that is not ſo eaſily reduced; becauſe the ſmaller that the quantity is which the plough takes off, the ſoil is the more effectually broken, and the ſurface made the ſmoother; and the more effectually that the mold is broken, and the ſmoother that the ſurface is made, the paſture is the more enlarged, and the weeds more effectually deſtroyed. This is agreeable to the ordinary practice, introduced no doubt from experience; for we find that a much leſs quantity is taken off when land gets the ſeed-furrow, the chief deſign of which is to enlarge the paſture, than at any other ploughing.

In the directions which we have given about ploughing, we have had chiefly in our view land employed in tillage; it is neceſſary to add ſomething with reſpect to the ploughing lea, or opening up graſs ground.

The Engliſh writers on agriculture, when giving directions about the opening of graſs ground, always ſuppoſe that the land is to be ſummer-fallowed; and they recommend to plough as deep at firſt as the nature of the ſoil will allow. They aſſign this reaſon, That it is not poſſible to plough deeper afterwards. They likewiſe direct to turn the earth upſide down, or on its back, as we have called it. The reaſon they aſſign for this, is, that the ſward or turf may be the ſooner rotten.

Some perſons tried this method of breaking up graſs-ground in Scotland, but they found great difficulty in reducing it: and we have reaſon to believe that many find it ſo likewiſe in England; for Mr. Tull, in his chapter upon ploughs, tells us, That if the turf lie long without being turned, the graſs from the edges will ſpread and form a new turf, and that the roots often ſet up new heads, and the former heads are converted to roots. As Mr. Tull's deſign is to ſhow the neceſſity of the four-coultered plough, we need not doubt but he has a little exaggerated the matter; for, upon a narrow inſpection, it will be found, that if turf is turned upon its back, the graſs will grow only from the ſides. However, we may conclude, from what he ſays, that the land in England is not ſo eaſily reduced in this manner, as ſome pretend.

On the rich lands in Scotland, they follow a method the very reverſe of this which has been mentioned. They commonly ſow after one ploughing of graſs-ground, and plough as ſhallow and narrow as poſſible; and alſo ſet the turf as exactly as poſſible upon its edge. It is not our buſineſs in this place to conſider the propriety of ſowing after one furrow. We may only obſerve, that if the land is good, a good crop may be expected; and if there is a good crop, the turf will be completely rotten before next ſeaſon. What we have to conſider, is, which is the moſt proper method to break and reduce the turf. It is certain, that the thinner and narrower the turf is taken off, the more eaſily it is torn aſunder, and the more that it ſtands

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on its edge, the harrows in going acroſs take the firmer hold, and make the greater impreſſion.

If this kind of graſs-ground is ploughed before winter in the manner mentioned, ſhallow and narrow, and the turf ſet upon its edge, it may be expected, if we are favoured with a little froſt, that in the ſpring the turf will be in ſuch a condition, as to be eaſily torn aſunder by the harrows, and the land itſelf in a proper condition to be ſown with oats, or to be ſummer-fallowed, and ſown with wheat.

Their barren lands they break up in the ſame manner as in England. They plough deep, and turn the turf over on its back. It ſeems, that the plants which grow on theſe lands have tougher and ſtronger roots than thoſe that grow on rich lands. This makes it more difficult to break the turf. If the earths of the furrows are ſet on their edge, the harrows turn them back, inſtead of tearing them aſunder. This happens whether the land is ploughed deep or ſhallow. But when the earths are turned on their back, and the land ploughed deep, the harrows raiſe a kind of mold upon the back of the turf, by which the hollows betwixt the earths are filled up, and nouriſhment afforded for the ſeed, the greateſt part of which falls into theſe hollows.

There is another method propoſed for opening up graſs-ground, and that is by trench-ploughing. This manner of ploughing is performed by one plough following another in the ſame track. The plough that goes firſt, turns over the ſward or turf; and the one that follows, turns up ſome inches of ſoil upon it. By this method there is ſufficient nouriſhment provided for the crop, and the ſward is rotten before next ſeaſon.

This kind of ploughing needs not be confined to the opening up of graſs-ground; it may be uſed in any ſoil that is deep; for by it ſome new ſoil is turned up, and a greater quantity employed in vegetation.

It has already been obſerved, that ploughing in ridges is proper for removing wetneſs. Every furrow becomes a kind of drain: the rain that falls upon the ridge, makes its way to the furrows, and by means of them is conveyed away from the field.

Ploughing in ridges is alſo proper for enlarging the ſurface. It is certainly an advantage to have the ſurface enlarged. Thereby not only a greater quantity of ſoil is expoſed to the influence of the air, but alſo a great quantity of it actually employed in vegetation. There is no more ſoil added to the field by enlarging the ſurface; but ſome of the ſoil that lies buried, while a field is in its natural ſtate, is expoſed to the air, and brought within reach of the roots of plants, when it is laid up in ridges. Some of the plants which we cultivate in our fields, have what are called horizontal roots, that is, roots that creep along the ſurface, and go down but a ſhort way. Now, it is obviouſly an advantage to theſe plants, to have a quantity of the ſoil below, to which their roots cannot extend, brought within their reach, which is done by enlarging the ſurface.

The tap-rooted plants, that is, ſuch as puſh one principal root perpendicularly downwards, have alſo horizontal roots, by which they are nouriſhed; and therefore it muſt likewiſe be an advantage to them, to have the ſurface enlarged.

To illuſtrate this further, let us ſuppoſe, that the roots of plants upon a field extend themſelves through the whole ſoil within four inches of the ſurface. Now, it is obvious, that there is more ſoil within four inches of the ſurface, when the ſurface is enlarged by ridges, than when the land is lying quite flat.

From theſe things then it appears, that a field contains more food, and has a larger paſture when in ridges, than when laid down level.

It muſt be acknowledged, that ſome conſiderable perſons are of a different opinion; and as this is the caſe, it will not be improper to conſider what is advanced by them.

There are ſome who mention the perpendicular growth of plants, as an evidence, that a ſurface, however much extended, can ſupport no more plants than the horizontal baſe. Though the fact is allowed, that plants grow perpendicularly, and that it is impoſſible to place more of them upon the ſurface than upon the baſe; yet it does not follow, that a field, when its ſurface is enlarged, can nouriſh no more of them: and it is to be remembered it is not more room which we contend for, but more nouriſhment. We may further obſerve, with reſpect to the growing of vegetables, that the enlarging the ſurface has this other advantage; it gives the plants more air, and thereby prevents them from falling down and lodging.

Mr du Hamel, to ſhow that the enlarging the ſurface by ridges is a real diſadvantage, obſerves, that ſuppoſing the ſlope in ridges is one foot in ſix, yet the ſurface will be to the horizontal baſe only as ſeventy-ſix to ſeventy-five, which, he ſays, is but a ſmall advantage, when compared to the loſs by the furrows.

In anſwer to this, it needs only be ſaid that there is no loſs by the furrows, unleſs when they are a real advantage to the reſt of the field. When land is dry, the corn is as good in the furrows as in any part of the ridge; and when the land is wet, the furrows ſerve for drains, and the loſs by them is more than made up by the advantage which the reſt of the field receives by being drained.

We may therefore conclude in the general, that the way of ploughing in ridges is preferable to the way of ploughing without ridges.

Having ſhown, that ridges are advantageous, as they remove wetneſs, and enlarge the ſurface, it is neceſſary now to conſider what kind of ridges are moſt proper for anſwering the ends propoſed.

As ridges remove wetneſs, when the ſoil is wet, the ridges ought to be narrow; for the greater number there are of ridges, there are the greater number of drains. When the ſoil is wet, the ridges ought alſo to be ſteep. For the ſteeper that the ridges are, the water more eaſily finds its way to the furrows.

When the ſoil is very dry, it is ſubmitted, if narrow ridges are not proper likewiſe. For by altering the ridges, and turning the furrows into the crowns, and the crowns into the furrows, a quantity of freſh ſoil is always employed in vegetation. When the crown of a ridge is turned into a furrow, it is obvious that ſome freſh ſoil is turned up, which was not employed in vegetation in its former ſituation; and the greater number there are of ridges, there is the greater quantity of freſh ſoil employed.

When the ſoil is juſt ſo wet as to occaſion loſs in the furrows, then the ridges ſhould be ſomewhat broader. For, in this caſe, the fewer there are of furrows, there is the leſs loſs.

It is proper to obſerve here, that a difference ſhould be made betwixt the ſituation of land in the winter, and its ſituation in the ſummer. It may be convenient ſometimes, when winter-grain is to be ſown, or when the land is to get winter-fallowing, to make the ridges very narrow; and, when ſummer-grain is to be ſown, to make them broader.

As it is an advantage to have the ſurface enlarged, the ridges ought to be made high in the middle, or crown. For the higher that the ridge is made, the more is the ſurface enlarged.

When the ſoil is ſhallow, the ridges, if broad, cannot be raiſed, without depriving the furrows of ſoil: and therefore, to enlarge the ſurface on ſuch land, the ridges muſt be made narrow. For this both enlarges the ſurface, and prevents the furrows from going below the ſoil.

When the ſoil is deep, the ridges may be made broader: for though the ridges are raiſed in the crown, yet ſtill there is ſoil left in the furrows. But then the ridges muſt not be made too broad: for it is evident, that narrow ridges give more ſurface than broad ridges, of the ſame degree of ſteepneſs; and do not cover the lower parts of the ridges ſo much from the influence of the ſun and winds.

It is neceſſary to obſerve, that though, in the general, it is recommended to raiſe the ridges in the crown, to enlarge the ſurface, and to allow the water more eaſily to find its way to the furrows; yet, in ſome low flat-lying land, it is proper to make the ridges as flat as poſſible, in order to raiſe the furrows. For the higher that the furrows are raiſed, there is, in ſome caſes, the greater command of the water, and it is the more eaſy to find a fall for conveying it away.

It is neceſſary to obſerve likewiſe, that flat ridges have this advantage over ſteep ridges; they can be ſown with greater exactneſs. It is obvious from the method of ſowing, that, in ſowing ſteep ridges, it is not poſſible to prevent a great proportion of the ſeed from falling into the furrows. It is obvious likewiſe, that this proportion is increaſed by harrowing. Whereas, in ſowing flat ridges, the ſeed is equal qually ſcattered, and the harrows do not remove it from its place.

From theſe obſervations, it is obvious, that ſoils in different ſituations require to be laid out in different kinds of ridges. It is abſurd, therefore, to aſſert, that, in every caſe, one kind of ridges is preferable to another; that narrow ridges are better than broad ridges, and flat ridges better than ſteep ridges. In ſome ſituations, one kind of ridges is moſt proper; and, in other ſituations, another kind is moſt proper. Every perſon ought, therefore, to conſider the nature of the ſoil he has to deal with, conſider the advantages and diſadvantages of each kind of ridges, and then determine which are moſt proper.

When there is nothing in the nature of the ſoil to determine what kind of ridges are moſt proper, then narrow ridges are to be preferred; for this reaſon, that a quantity of land in narrow ridges is ſooner ploughed than when in broad. It is obvious, that the two firſt furrows which the plough takes off from the ridge, are wider than any taken off afterwards, eſpecially if the plough begins in the furrow, as is frequently the caſe; ſo that the greater number there are of ridges, the field is the ſooner ploughed. Beſides, when ridges are broad, it is obvious, that the plough has more work, and muſt take longer time in turning, than when they are narrow. But then it is ſuppoſed that the ridges are ſtraight and equal. If they are not, the greater number there are of them, the greater is the trouble, and the more time is ſpent in ploughing. This, however, it muſt be owned, is of no great importance; becauſe it ſeldom happens, that the kind of ſoil does not determine what kind of ridges are moſt proper.

Having conſidered the kinds of ridges proper for land, according to its different ſituations; it is proper to inquire, whether there are any qualities which ridges ought to have, whatever is the ſituation of the land.

It will eaſily appear, that all ridges ought to be made ſtraight. Crooked ridges, it is obvious, are attended with ſeveral inconveniencies. In ploughing them, the cattle are not always going exactly in the ſame direction with the plough; ſhort turnings are often neceſſary, as fields are generally bounded by ſtraight lines, or lines not crooked in the ſame manner with the ridges; and, when there is a ſmall deſcent, the water, as it runs in the furrows, meets with reſiſtance.

It is obvious, that when the plough goes in a curve, as it does in ploughing crooked ridges, the draught is not in the ſame direction with the beam, but is either to the right or left of it; and this gives the plough either too much or too little land.

It is obvious likewiſe, that, when ridges are crooked in a manner different from the lines by which a field is bounded, in ploughing the ridges upon the ſides, one part of them muſt be finiſhed before ſome other parts are near done; and thus ſhort turnings are neceſſary, which hurt the land much by the treading of the horſes.

It is obvious likewiſe, that, as a crooked furrow is continually altering the direction of the water, and has a leſs deſcent than a ſtraight furrow, the water, as it runs along it, muſt meet with greater reſiſtance, and thus penetrates the ſoil, and makes it more difficult to convey it away.

Theſe inconveniencies are removed by making the ridges ſtraight. For, in ploughing ſtraight ridges, the cattle are always going in the ſame direction with the plough; no ſhort turnings are neceſſary, as fields can be made of an equal breadth in all places; and the furrows having a greater deſcent, the water meets with leſs reſiſtance, and is more eaſily conveyed away.

Straight ridges not only remove the inconveniencies with which crooked ridges are attended, but it is found that they are to be attended with no inconveniencies themſelves: they require indeed a little attention in the ploughman, which is itſelf an advantage; and therefore, upon all occaſions, are to be preferred.

As, in all kinds of ſoil, ridges ought to be ſtraight, ſo likewiſe they ought to be equal, equal one to another, and the ſame ridge equally broad in all places. Unequal ridges are attended with inconveniencies, as well as crooked ridges. It is difficult to ſow them with exactneſs; it is difficult to alter them, when neceſſary; and the plough muſt often turn in the middle of the ridge, which does great harm, by the treading of the horſes, or it muſt be driven empty to the end.

Theſe inconveniencies may be removed by making the ridges equal. Equal ridges may be ſown with greater exactneſs, and conſequently with leſs ſeed; it is eaſy to change them, one into two, or two into three, as occaſion requires; and the ſame furrow that finiſhes the ploughing of the ridge in one place, finiſhes it in all places; ſo that there is no neceſſity to turn the plough in the middle of the ridge, or to drive it forward the ſhorteſt ſpace, without turning up a furrow.

In many places of England and Scotland the ridges are ſtill crooked and unequal; and, in many places, they are much broader, and much higher raiſed in the crown, than the nature of the ſoil allows. Were the ridges altered, and the fields laid down in a proper manner, as the ſoil requires, it would be a great advantage. At the ſame time, it may be obſerved, that much harm is done, by proceeding in this matter with too much precipitancy. It is neceſſary, therefore, that we conſider it as an affair of ſome importance.

It is neceſſary to obſerve, in the firſt place, that ridges muſt not be raſhly altered; on the contrary, great caution is to be uſed.

If the ſoil is very dry, ridges may be altered without great danger, though high; and they may be made ſtraight without being levelled. For, though the old furrows are ſtill lower than the reſt of the field, yet this is attended with no bad conſequences in dry land; and by degrees, they are filled up in ploughing. But then, it is to be obſerved, that there is not much land in Scotland, on which the ridges, at preſent, are high raiſed, in its nature ſo dry, as to allow this to be done.

If the ſoil is *wet*, the ridges cannot be made ſtraight till the ground is level, without great danger. For the water will lodge in the hollows of the old furrows, from whence it will not be poſſible to force it. Some perſons that make their ridges ſtraight before they are ſufficiently levelled, draw water-furrows along the hollows of the old furrows, to carry off the water that is apt to lodge there. This is of ſome uſe, but does not fully anſwer the purpoſe. A quantity of looſe earth, in ploughing, is thrown into the old furrows. The water, as it falls, penetrates this looſe earth, and is retained by it, notwithſtanding the water-furrows. Beſides, theſe water-furrows muſt be neatly cleaned out with a ſpade, and made deeper in the places where they are intercepted by the crowns of the new ridges, otherwiſe they are of very little uſe.

Before ridges can properly be made ſtraight, it is neceſſary therefore that the land be made as level as poſſible.

But it muſt be obſerved, that it is as dangerous to level ridges raſhly as to alter them before they are levelled: for if ridges are levelled too faſt, and thereby a great depth of looſe earth thrown ſuddenly into the furrows, it will not be poſſible to convey away the water that falls upon them. The water as it falls will ſink to the bottom, and there will lodge and chill the ſoil; and the earth thrown into the furrows being looſe, the cattle in ploughing muſt ſink to the bottom likewiſe, by which the land is very much patched.

It is recommended therefore to every perſon, ſeriouſly, to conſider the nature of the ſoil he has to deal with, before he proceeds to the altering old ridges; and, if the ſoil is wet, to level the ridges very gradually. When the ſoil is deep, and inclining to be wet, and a ſufficient ſlope for carrying off the water, it is probable, that the loſs ariſing from the levelling ſteep and broad ridges ſuddenly, may exceed the profit of many years ariſing from the ridges being properly laid down; and therefore, if a view to incloſing makes it neceſſary to ſtraight the ridges, the levelling them ſhould be the work of ſeveral years. Even ſuppoſing that the ſoil is ſhallow, and the ridges raiſed ſo high, that there is nothing but graſs left in the furrows, yet ſtill it is improper to level the ridges too faſt, though levelling in this caſe is neceſſary.

In levelling ridges a great hollow is made in the crowns. This is occaſioned by frequent ſucceſſive cleavings, which is the method commonly uſed for levelling ridges. It is obvious, that by the firſt cleaving a hollow is made in the crown of the ridge equal to the depth and breadth of the furrow which the plough makes; whereas the parts on each ſide of the ridge are but little levelled, and

and at each succeſſive cleaving this hollow is made greater. Such a quantity of new earth immediately turned up, is not fit for vegetation. Beſides, this hollow becomes ſo great, and the parts of the ridge on each ſide of it become ſo ſteep, that it is impoſſible to plough them in a proper manner.

In this caſe, when levelling is ſtill thought proper, ſome furrows from each ſide muſt be thrown back by the plough into this hollow, by which a new ſmall ridge is formed upon the crown of the old one, and then the remaining parts of the ridge may be levelled as before. Some perſons, inſtead of this, plough acroſs the ridges. This method ſerves the ſame purpoſes; it both throws ſome earth into the hollows, and levels the ridges; for the plough in going carries off ſome earth from every height, and leaves ſome in every hollow. But then land muſt not be left in this ſituation during the wet ſeaſon, unleſs water-furrows are drawn along the furrows, and alſo in ſome caſes along the crowns; for unleſs this is done, the water that falls upon the field cannot be conveyed away. At the next ploughing, the whole old ridges may be levelled in the ſame manner as at the firſt ploughing; or, if thought more proper, may be divided into two equal ridges, ploughed in ſuch a manner that the furrow betwixt them may be exactly in the crown of the old ridge, and the other furrows exactly in the furrows of the old ridge. By this operation the old ridge is raiſed from the furrows, and levelled from the crown.

When a perſon is upon a ſcheme of levelling, this method of dividing the ridges into two will be found very proper, either when winter-grain is to be ſown, or when the barley-land gets the winter-ploughing.

Though land may be in ſuch a ſituation as to allow the ridges to be levelled with ſafety, yet unleſs it is remarkably dry, and in no caſe in danger of being damaged by too much water, the ridges ſhould not be altered, excepting when the land is ſummer-fallowed; and in that caſe, beſides the ploughing that alters the ridges, there ought to be another before the wet ſeaſon comes on, that ſo the bottom may be ſufficiently firm to reſiſt the water.

We have obſerved, that ridges ſerve to remove wetneſs, and to expoſe the ſoil to the influence of the air, and we have ſhown what kind is moſt proper for theſe purpoſes. But this is not enough; it is neceſſary likewiſe to conſider in what manner ridges ought to be placed. This is a matter of ſome conſequence: for, according to the poſition of ridges, water may be either conveyed away or retained; and ſome aſſert likewiſe, that by this the ſoil may be better expoſed to the influence of the ſun and wind. Theſe things therefore muſt be kept in view in the placing of ridges.

When the land is wet, as is often the caſe, it is certain that ridges ought to be placed with a view to the conveying away the water: but when land is dry, as is ſometimes the caſe, then ridges ſhould be placed with a view to the retaining the water.

The moſt common way of placing ridges where there is a ſlope, is along the declivity in a ſtraight line from the top to the bottom; and land is commonly laid out with a view to this. Where the declivity is gentle, this is, no doubt, a very proper way of placing the ridges; but if the declivity is great, this way of placing the ridges allows the ſoil to be waſhed away by the rain. It is obvious, that water, in running off of land, carries a part of the ſoil along with it, and the quantity is great, in proportion to the violence with which it runs. In climates where there are heavy ſhowers of rain, the damage done by this is not inconſiderable. Therefore, in this caſe, placing ridges acroſs the declivity is the moſt proper way; for when ridges are placed acroſs, the water meets with many interruptions in its courſe, and does not run off with ſuch violence as when placed along from top to bottom, and therefore does not carry off ſuch a quantity of the ſoil along with it.

Inſtead of this ſome perſons make the ridges very narrow. This ſerves the ſame purpoſe; for in proportion to the number of furrows, there is the leſs water in each furrow, and conſequently it runs with leſs violence. However, placing the ridges in this manner is not ſo proper for this purpoſe as placing them acroſs the declivity, and, beſides, is not ſo proper for retaining the water in a dry ſeaſon.

When land is very dry, and in no danger of being damaged by the ſtagnation of water, the ridges ought to be placed acroſs the declivity, as near the level as poſſible; for this retains both the water and the ſoil. It is obvious, that when ridges are placed in this manner, the water cannot get off by running along the ſurface, by which the ſoil is in greateſt danger of being carried away. As the furrows ſtop it in its courſe down the hill, it can get off in no other way than by penetrating the ſoil. By this a part of it is retained; what of it gets off is clear, and carries no ſoil along with it.

When land is dry at the head of the ridges, and wet at the foot, and no proper fall for carrying off the water, as is frequently the caſe, the ridges ſhould be placed in the ſame manner, directly acroſs the declivity. For, in this caſe, every furrow in ſome meaſure retains the water that falls upon the ridge above, and thereby prevents it from ſinking towards the bottom of the field, and lodging there. By this way of placing the ridges, the dry part of the field is rendered wetter, and the wet part of the field is rendered drier than otherwiſe they would be.

This is likewiſe a very proper way of placing the ridges, even when the declivity is but ſmall, if the land is in the ſituation mentioned, dry at the head, and wet at the foot. It muſt be owned, however, that this will not entirely anſwer the end propoſed: for the water will penetrate the ſoil; and when it is reſiſted by till or clay, will find its way along theſe to the bottom of the field. But this will not be ſo ſudden, as in the other way of placing the ridges; and the ſoil at the head, which is naturally dry, will receive more benefit from the rain as it falls.

When land is wet, and the water may be conveyed away from the bottom of the field, the ridges ſhould be placed acroſs likewiſe; not directly, but with a ſmall ſlope to a drain or furrow on the ſide of the field from top to bottom, by which the whole water is conveyed away. In this caſe every furrow becomes a drain to the ridge below, and prevents the water from running over it.

When land is wet from the breaking out of ſmall ſprings, this way of placing the ridges is alſo very proper. The furrows convey away the water as it riſes, and prevent it from doing any damage.

It is neceſſary to obſerve, that ridges placed in this manner, to ſerve theſe purpoſes, ſhould not be altered; for when the furrow is kept in one place, it is a more proper drain than when altered. When the furrows are kept in one place, the bottom is always firm, and the water runs eaſily along it; whereas, if changed, it may fall upon places of the field, where the ſurface, being raiſed by former ploughings, will prevent them from reaching the firm bottom. Beſides, if the ſprings break out in the furrows, by changing their place, they may break out in other parts of the ridge.

It is neceſſary to obſerve likewiſe, that ridges placed in this manner ſhould not be raiſed in the crown, but kept quite flat; that ſo, by the natural deſcent of the ground, the whole water that fall upon the ridge may be conveyed into the furrow below.

It was before obſerved, that ſome perſons aſſert, that, by a proper poſition of ridges, the ſoil is better expoſed to the influence of the ſun and air. Theſe perſons recommend the paying a regard to this. But it cannot be done excepting when the land is quite flat, and when the placing of the ridges makes no difference as to its wetneſs. However, as this is repreſented by thoſe perſons as important, ſome attention ſhall be given to what they ſay.

Some adviſe the placing the ridges ſouth and north; and the reaſon which they aſſign for this, is, that thereby the ſun may have an equal influence upon all parts of the ridge.

Others, again, adviſe the placing the ridges eaſt and weſt; and the reaſon which they aſſign, is, that they may ſhelter each other from the cold north wind.

Which of theſe advantages is the greateſt, is uncertain. It is even uncertain whether they can be called advantages at all.

It may be diſputed, whether, in the winter-ſeaſon, cold or heat is moſt beneficial to land. That heat is beneficial and cold deſtructive to plants, is certain. But cold poſſibly may be as proper as heat for preparing land for the nouriſhment of plants. It is allowed, that the coldneſs of the north wind,

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is in some measure owing to the quantity of salts that it carries along with it. These salts are beneficial to land; and therefore an exposure to the north seems to be rather a benefit than a disadvantage. This is confirmed from observation. The lands on the north side of rising grounds are, generally speaking, more fertile than those on the south-side. It is certain, that the richest lands in Scotland have this situation, and are exposed to the north.

It may be disputed likewise, whether the north or the south side of an east and west ridge has most benefit from the sun in summer. It is not to be denied, that the rays of the sun fall more directly on the south side of the ridge; but then let it be observed, that the north side has the benefit of the sun's rays in the mornings and evenings, when the sun is so low, that the south side is under the shade; which may possibly balance the loss sustained by the greater obliquity of the sun's rays about mid-day.

These things have been mentioned, to show, that it is uncertain, which way of placing ridges exposes the land best to the influence of the sun and air; and therefore, that, in placing them, it is needless to have any view in this. When the placing of ridges makes no difference as to the wetness of land, then we are chiefly to have in view the conveniency of ploughing and laying out the land in proper breaks.

There are three different ways of ploughing ridges: gathering, casting, and cleaving.

Gathering keeps the crown and furrows of the ridge in the same place in which they were before. The plough begins in the crown, and ploughs out the ridge, turning the earth towards the crown, where it entered. Every ridge is ploughed by itself; or, instead of this, the halves of two contiguous ridges may be ploughed together. By this method of ploughing, the ridge is higher raised than before. It is obvious, that, as the earth on each side is turned upon the crown, and thrown up out of the furrows, the ridge is raised, both by making the crown higher, and the furrows lower.

Casting keeps the crowns and furrows likewise in the same place, in which they were before. The ridges are ploughed in pairs. The plough may enter in the furrow betwixt the ridges, and plough out the ridges, turning the earth towards the furrow, where it entered. Or the plough may enter in the furrow on the right side of the two ridges, then turn to the one on the left, and plough out the ridges, turning the earth to these furrows, and from the furrow that is betwixt them. By this method of ploughing, the ridges are kept of the same height in the crown, and one of the furrows made a little higher, and the other a little lower than before. The earth is taken from one furrow, and thrown into the other, and this is done alternately through the field. If this is reversed at next ploughing, that is, the earth turned into the furrows from which it was taken at the former ploughing, thereby the ridges are preserved in the same situation.

Cleaving is the reverse of gathering. The plough enters in the furrow on the right side of the ridge, turns to the furrow on the left side, and ploughs out the ridge, turning the earth from the crown towards the furrows. Every ridge is ploughed by itself; or, instead of this, the halves of two contiguous ridges may be ploughed together. If the ridge is raised in the crown, by this method of ploughing it is made flatter. It is obvious, that, by this method of ploughing, earth is thrown into the furrows, by which they are made higher; and that earth is taken from the crowns, by which they are made lower. If the ridge is already flat, by this method it is changed, and the crown turned into the furrow.

When a field is laid out in the manner judged most proper, with respect to the breadth and height of the ridges, it should be ploughed in one or other of these ways mentioned, according to its situation. If the ridges are broad and high, casting will be found to be the most proper method of ploughing. For this is the only way by which they can be ploughed, and yet kept in the same situation: cleaving will make them flatter; and gathering will raise them higher. If they are flat and narrow, cleaving will be found to be the best method. Cleaving flat ridges, and thereby turning the crowns into furrows, and the furrows into crowns, has these peculiar advantages: a field is much sooner ploughed in this way, than in any other; and a quantity of fresh earth, at every ploughing, is exposed to the air, and employed in vegetation: and the ridges being kept level, are sown with exactness. In no case gathering is proper, unless when the proper situation of the ridge renders it rather too wet for winter grain.

It may not be improper, in this place, to consider a method of ploughing, used in some places, called ribbing. This method of ploughing is performed by making furrows about two feet distant from each other: one half of the surface is untouched by the plough, and the other half, which the plough turns up in making the furrows, is thrown on the top of what remains fast. The land may be ploughed in this manner, either without regard to ridges; or the plough may be made to enter and turn, as it does in gathering, casting, or cleaving; that is, a ridge may be ribbed in the way of gathering or cleaving; and two ridges may be ribbed in the way of casting. This kind of ploughing is seldom practised but in the beginning of winter, and upon land to be sown with barley, after two more clean ploughings. It does not prevail so much as formerly, and is very much condemned by our modern improvers. But, however much it may be condemned, it certainly has its uses. It keeps the land dry; the rain that falls is confined to the furrows, from whence the loose earth is taken, and easily finds its way off. It facilitates the rotting of the stubble, by covering it and keeping it dry; it makes the frost penetrate a greater quantity of the soil; and it also exposes a larger surface to the influence of the air. These things make this kind of ploughing, in some cases, preferable to a clean ploughing.

There is also another method of ploughing called bouting. It is performed by throwing the earths of two furrows towards each other upon some fast land. This is certainly an improvement upon ribbing, and better answers all the purposes of it.

By this method ribs are placed where furrows were before, and furrows where ribs were before; and the surface is entirely changed, what was above turned down, and what was below turned up. These two ploughings may be performed with the same strength, and in the same time with one clean ploughing; and, it is probable, that, upon trial, in some cases, will be found more beneficial.

As a further improvement of this method of ploughing, it is proposed to rib the land, and, at the same time, to plough it clean. This is done by throwing the earths of three or four furrows together in such a manner, as to leave no fast land below; and is the same thing with ploughing the land in ridges about three feet broad, from the middle of one furrow to the middle of the other. This serves all the purposes of the other kinds of ribbing, and, besides, has these further advantages; the land being clean ploughed, weeds are more effectually destroyed, and the soil is better opened for receiving benefit from the frost and air. This method may likewise be reversed by another ploughing. The surface may be entirely changed, and the ribs turned into furrows, and the furrows into ribs.

These different methods of ploughing, the last two excepted, are known to every common ploughman, and they should be attended to by every improver, as of importance; without a proper knowledge of them he cannot give directions to his servants, nor prevent them from falling into blunders in the execution, which they are but too apt to do. The ignorance of a master in things which his servants are acquainted with, is attended with bad consequences; it gives them an indifferent opinion of his knowledge of farming, and makes them despise every new thing which he proposes, as absurd and whimsical.

It was observed, that ploughmen are apt to commit blunders in ploughing. Thus in gathering ridges, if care is not taken in beginning the ploughing of the ridge, some firm land will be left in the crown, and the crown itself so much raised above the rest of the ridge, that no seed will lie upon it. It is sometimes observed, that just on the crown of a ridge, where the soil is deepest, there is less corn, and more root-weeds, than in any other part of the ridge. This is certainly occasioned by allowing firm land to remain there in ploughing, and by raising the crown like a peak above the rest of the ridge. The ploughman, instead

ſtead of turning back the earth of the firſt furrow, and the firm land below it, keeps at ſuch a diſtance, as to lay the earth of the ſecond furrow up to it, or on the top of it. This leaves firm land betwixt the furrows, and raiſes the crown of the ridge to a peak. But if he is directed to draw the furrows ſo near, as to turn back the earth of the firſt in making the ſecond, no firm land will be left, and the earth, that by the other method is thrown upon the crown, will be ſcattered.

This blunder is oftener committed when flat ridges are cleaved. In cleaving, if the ridges are ploughed out turning the plough always to the left, it is impoſſible to prevent the two furrows, laid together in the crown of the new ridge, from being at too great a diſtance, and raiſed higher than the reſt of the ridge. When ridges are cleaved in this manner, the earth of the firſt furrow that the plough makes, is turned over upon firm land, and backed by the earths of the other furrows in their courſe. This makes it impoſſible to get at this firm land in ploughing the next ridge, without turning up the firm land itſelf, and the earth of the furrow laid over it, upon the top of the earth of the ſecond furrow, by which the crown of the ridge would be raiſed to a high ſharp peak. Now, to prevent this, the ploughman, in ploughing the next ridge, keeps at a proper diſtance, and does not touch the firm land, over which the earth of the firſt furrow is laid. But it may be obſerved, that he muſt either keep at ſuch a diſtance as to leave firm land in the crown of the new ridge equal to the breadth of two furrows, or he muſt turn the earth of his furrow upon the top of the earth of that firſt furrow. By this the crown of the ridge is ſtill high raiſed, and ſome firm land ſtill left.

But ridges of this kind may be cleaved without leaving any unploughed land, or without raiſing the crown much above the reſt of the ridge. The method of doing it is this: after the plough has made the firſt furrow, inſtead of turning to the left, and making a furrow on the other ſide of the ridge, it turns to the right, and throws back the earth of its firſt furrow along with the firm land below it, and after going round again in the ſame courſe, turns to the other ſide of the ridge, and goes twice round in the ſame manner, after which the ridge betwixt the two fierings, as they are called, is ploughed out, as at firſt propoſed. When the ploughing of the ridge is finiſhed, a new fiering is made in the next furrow, by the plough going twice round, as before directed, and then the ridge betwixt the laſt-made fiering and the ploughed land is ploughed out in the ſame manner as before; and in the ſame way the fierings are made till the whole field is ploughed. By this method there is no firm land left below the earth of the furrow; and the earth that is turned towards the crown being ſcattered, and not laid all in one place, the crown itſelf is not much raiſed above the reſt of the ridge.

It may be obſerved likewiſe, that in caſting ridges, if care is not taken, the furrow towards which the earth is thrown will be ſo filled up as to be improper for a drain. The plough enters the ridge near the furrow, and throws the earth towards it, turns to the right, and throws the earth from the oppoſite ſide towards it likewiſe; and then goes in the tract of the old furrow, betwixt the earths of the furrows made on each ſide. This furrow, towards which the earth is thrown, is ſometimes ſo filled up as to render it improper for a drain. We have ſhown how the earth around it is ploughed. The furrow which the plough makes going in the track of the old furrow, betwixt the earths of the furrows on each ſide, is called a gore-furrow. On the left ſide, the plough having no mold-board, the looſe earth falls back into the furrow behind the plough, and fills it up, or at leaſt makes it unfit for a drain, which in wet land is a great diſadvantage.

But this may be prevented by proper care; the furrow may be made clean, and fit for a drain. The method of doing it is this: the plough enters about two feet from the furrow, and inſtead of turning to the other ſide, returns on the ſame ſide, turning back the earth, and then goes round again in the ſame courſe; after this turns to the other ſide of the furrow, and does the ſame, goes twice round. By this the gore-furrow is made quite clean, and, like the crowns of ridges, formed at about two feet diſtance on each ſide.

Some other things of a like nature might be mentioned. Theſe have been inſiſted upon, to ſhow, that it is neceſſary to attend to every circumſtance of ploughing, that ſo this important work may be performed in the moſt proper manner.

The chief deſign of harrowing land is, to ſmooth the ſurface. By this weeds are deſtroyed, and ſeed, if ſown, is covered.

Root-weeds, that are looſed by the plough, are ſometimes torn up by the harrow, and thus are deſtroyed. When this is the deſign of harrowing, the harrows ſhould go acroſs the ridges, or rather acroſs the way that the plough has gone. Becauſe, by going acroſs the earths of the furrows, the teeth of the harrow are apter to catch hold of the roots, than if it ſhould go in the ſame way with the plough.

Though the harrow may bring ſome part of the roots above ground, yet commonly ſome other parts continue below, which will grow if undiſturbed. This makes it neceſſary for perſons to follow the harrows, and gather all the roots which they obſerve brought up, and carry them off of the field, or burn them.

If harrowing does not actually tear up the roots, it encourages their vegetation, by filling up the hollows, and thereby defending them againſt their greateſt enemy, the drought. On this account harrowing is improper for deſtroying root-weeds, excepting after a ſpring-ploughing, when the land is ſoon to be ploughed again for ſeed. For at this ſeaſon the drought is ſeldom violent, and it has not time to operate in the deſtruction of the roots; and therefore whatever the harrows bring out is ſo much deſtroyed.

The ſame things that make harrowing improper for deſtroying root-weeds, make it very proper for deſtroying ſeed-weeds. The ſmoother that the ſurface is made, and the more effectually that the mold is broke, the ſeeds near the ſurface are the more expoſed to the air, and the ſap, which is in the land, the more effectually retained. Both theſe are neceſſary to promote the vegetation of the ſeeds; and they muſt vegetate before they can be deſtroyed. But harrowing not only promotes the vegetation of the ſeeds of weeds, but alſo deſtroys the young plants when ſprung up; ſo that one ploughing, if the ſeaſon is favourable, and ſoil allows, may be attended with ſeveral harrowings, and thereby ſeveral crops of weeds deſtroyed.

If land riſes in hard clods, the harrow makes but little impreſſion; at leaſt before the clods are broken, the land is made ſo firm by the treading of the horſes, and the weight of the harrows, as to render the work uſeleſs, and ſometimes deſtructive. Great care ſhould therefore be taken to prevent land from being brought to this ſituation. If land once riſe in hard clods, it is vain to expect to break them with the harrow, ſo as to cover the ſeed. Unleſs the ſeaſon is very wet, it will remain in this ſituation through the ſummer, and afford but little nouriſhment for the crop. Sometimes it will remain in this ſituation after men have attempted to break the clods with malls.

If the ſoil is light and ſpungy, it can ſcarcely get too much harrowing; for the more that it is harrowed, it becomes the firmer. But if the ſoil is ſtiff, the leſs harrowing it gets the better, if the purpoſes propoſed are anſwered. The effects of harrowing are in this caſe contrary to thoſe of ploughing. Ploughing renders ſtiff ſoil more free and open, but harrowing renders it ſtill more firm and ſolid.

The ordinary way of harrowing after ſeed is ſown, is firſt along the ridges, then acroſs, and then along again. If ridges are flat, they may be harrowed either along or acroſs; and the work may be begun or ended either way. But if the ridges are ſteep, it is improper to begin by harrowing acroſs, becauſe thereby too much of the ſeed will be drawn into the furrows. If the ridges are very ſteep, for the ſame reaſon, it is improper to harrow acroſs at all. For another reaſon it is thought improper to harrow acroſs ridges when the land has been ploughed immediately out of lea or graſs. In ploughing this kind of land, the ſward is for the moſt part turned over whole; ſo that when the harrow goes acroſs, inſtead of tearing the ſward, it is apt to turn it back into the furrow from whence it was taken. When ridges are gathered or caſt, this will probably happen. In caſting, the earths of the furrows on one ſide of the ridge are turned towards the crown; and, in gather-

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ing, the earths of the furrows on both sides are turned the same way; and therefore the harrows, when drawn from the crown to the furrow, are apt to take hold of the unbroken sward, and turn it back But this does not so readily happen when the ridge is cloven. Because in cleaving, the earths of the furrows on both sides of the ridge being turned from the crown, the harrows, in going up from the furrow, are not in such danger of turning them back. In ploughing lea, the earths of the furrows are sometimes placed as exactly as possible upon their edge, that so they may be the more easily torn by the harrows. When these are turned to the crown, they do not support each other; and are therefore easily turned back by the harrow, in going from the crowns to the furrows: but when the earths are turned to the furrows, so they support each other by their weight; and therefore are not so easily turned back by the harrows in going up from the furrows to the crowns.

Rolling of land is practised with success, both on land lying in grass and on land in tillage. It is of advantage to land in grass, by pressing down mole-hills and mole-runs. Some say, that it also destroys fog.

When land is laid down in grass for hay, rolling is of use in smoothing the surface; and, when laid down in grass for pasture, it makes the grass stool, or tiller, and grow thicker.

There is a kind of land, which, when clover is sown upon it, throws out the young plants after frost. Rolling, in the beginning of winter, and immediately after the frost is gone, it is said, will, in some measure, prevent this. The first rolling prevents the frost from penetrating so deep, as otherwise it would do; and the second makes the land firm, after having been loosed by the change from frost to open weather.

Rolling may also be used with advantage upon land in tillage. When the land is naturally stiff, and may be reduced by the harrow, rolling is very improper: for it makes this kind of land still firmer than the harrow does. But if the land rises in clods, which the harrow does not reduce, rolling is very proper; for it smooths the surface, and breaks the clods, more effectually than harrowing.

When the land is light and spungy, the roller should always be applied after seed is sown; for it is scarcely possible to make this land too firm.

It was observed, that, to destroy root-weeds, land should be made rough, and raised in as large pieces as possible; and that it should be allowed to lie for some time in that situation. Rolling, after this, is of great use; for, without it, if the weather continues dry, it will not be possible to make the land fit for receiving another ploughing.

If the land is soft below, and some hard clods upon the surface, which the harrow does not break, rolling may be used with some advantage: for, besides smoothing the surface, it will bruise some of the clods; and such of them as are pressed down, will be dissolved by the natural fermentation of the soil, if in good heart.

Sometimes in stiff land, ploughed dry, after a former wet ploughing, or when, by any accident, it has been much trod upon, the whole rises in hard clods, which the harrows cannot break, so as to cover the seed. In this case rolling is of great use. It bruises some of the clods; and, when followed by the break-harrow, these clods are raised up and broken. Though rolling should do no service but smooth the surface, yet, on that account, it should be practised. For when the surface is smooth, the corn may be cut down more expeditiously than when it is rough and uneven. When grass-seeds are sown for hay, it is absolutely necessary to smooth the surface: the roller is most proper for this. Some use it before, and some after sowing. When it is used before sowing, the seed is more equally scattered.

Grass-seeds must be sown in such a manner, as to lie near the surface; otherwise they will not vegetate. The making the land firm by rolling is therefore an advantage, as, by it, the sap is better preserved; and this does not so much damage to grass as to corn, for the several kinds of it are commonly better foragers.

But however all the operations of ploughing, harrowing, and rolling are performed, something will be still wanting to promote vegetation, and this want is effectually supplied by certain substances called manures. To apply these substances in such a manner, as most effectually to promote vegetation, it is of importance to know their natures, and the ways in which they operate. This is the more necessary, as, without it, we cannot know how to apply them in the most proper manner to the different soils.

Manures operate, by communicating to the soil with which they are mixed, the vegetable food which they contain; by communicating to it a power of attracting this food in greater plenty from the air; by enlarging the vegetable pasture which it contains; and by dissolving the vegetable food which it is already possessed of, and fitting it for entering the roots of plants.

Manures are very different in their natures. Some of them operate in all the ways mentioned; and there are none of them that do not operate in more ways than one.

Great mistakes have arisen from supposing that manures operate only in one way. None have been attended with greater loss, than supposing that they serve only to divide the soil, and that tillage may be substituted in their place. This is Mr. Tull's opinion, and is, indeed, the fundamental principle of his horse-hoeing husbandry.

Before one changes the ordinary practice of agriculture, in so important a point as banishing manures from his fields, the good effects of which are so obvious; he must be certain, that the principle which determines him to so important a change, is itself well-founded.

Mr. Tull has endeavoured to prove, that earth is the food of plants; and hence infers, that to divide the earth into minute particles, by which it is fitted for entering their roots, is all that is necessary in agriculture: and this, he asserts, may be done by tillage, without manures.

When treating of the food of plants, we have attempted to show, that other principles, besides earth, are in the composition of this food: and, if this is true, the want of manures, which provide these other principles, cannot be supplied by tillage.

But supposing we allow, with Mr. Tull, that earth is the food of plants, yet still it does not follow, that tillage may supply the place of manures. It is certain, that every particle of earth which we observe, is not of the kind that is the food of plants. Every soil is a composition of different earths; several of which, it is obvious, are not of this kind.

The great difference in soils equally pulverised, is a plain and convincing evidence of this. Now, let it be observed, that the earth contained in dung is of this kind; it has already been food to plants, and therefore though all that is contained in the greatest quantity of dung laid on at one time, is but small in proportion to the quantity of soil employed in vegetation, as Mr. Tull justly observes; yet it may be considerable in proportion to the quantity that is really the food or pabulum of plants. If the quantity of earth contained in the quantity of dung commonly laid on at one time, is compared with the quantity of earth contained in the richest crop, it will be found several times larger; and therefore, by the laying on of this dung, food is provided for several good crops.

Besides, let it be observed, that the mechanical action of the plough cannot increase the number of the particles by which plants are nourished; they are so small as not to be observed in water. Mr. Tull supposes, that they are as small as those upon which the colour of bodies depends. Now, though pounding earth in a mortar may perhaps do something to increase them, yet the action of the plough can never be supposed to do it. The plough can do no more than open the soil, or enlarge the pasture of plants, and allow them to extend their roots in search of their food, but does not increase the quantity of it; and therefore tillage cannot supply the place of dung, which not only opens the soil by its fermentation, but also increases the vegetable food by the earth which it contains.

It may be further observed, that the fermentation raised by dung continues for a considerable time; so that though, by ploughing, the soil may be as completely divided as by the fermentation of dung, yet it will not continue so: for after seed is sown, the artificial pasture raised by ploughing is continually decreasing while the crop is growing; whereas the artificial pasture, raised by the fermentation of dung,

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is continued by the continuance of this fermentation; and therefore, though in the horfe-hoeing hufbandry the want of dung may be fupplied by hoeing, yet, as Mr. Tull indeed obferves, dung is ftill neceffary in the old hufbandry.

If perfons attentively confider the effects of manures, it will appear that they operate in all the ways mentioned.

Manures are found to enrich the beft pulverifed foil, and to do this again and again, after it is exhaufted by crops. It is almoft an univerfal practice in Scotland, to lay dung upon land that is kept conftantly in tillage once in three, four, or five years. It is obferved, that after the dung is laid on the land becomes rich, and that the crops turn gradually worfe and worfe, till the whole virtues of the dung are exhaufted; and it is alfo obferved, that immediately upon the dung being again applied, the land becomes rich as before. It is natural to conclude from this, that dung promotes vegetation by increafing the quantity of the vegetable food.

It is found, that fome manures lofe part of their virtues by being long expofed to the air. After dung is fufficiently rotten, the longer that it lies it becomes of lefs value, and does not enrich fo large a quantity of land as when ufed in proper time. The dung of cows dried upon their pafture, gathered, and laid upon other land, is fcarcely to be difcerned in its effects on the crops produced: the fame quantity applied, whether carried from the byre, or by folding the cattle, enriches the land. From this it is obvious, that this kind of manure contains the vegetable food in itfelf, and does not receive it from the air.

It is found, that fome manures operate the fooner, and with the greater violence, the longer that they are expofed to the air before they are ufed. Lime and marles are of this kind; the longer they lie expofed, they operate the fooner; and it is obferved, that they have a ftrong power of attracting the virtues of the atmofphere. From thefe things it is reafonable to infer, that thefe manures operate, by communicating to the foil with which they are mixed, a power of attracting the vegetable food from the air.

It is obferved, that fome manures exhauft land of its vegetable food, and do not reftore it again when immediately applied. This is found to be the cafe with lime. Land thoroughly limed has been found to carry many very good crops: by degrees however the virtues of it have been exhaufted, and the land reduced to a worfe fituation than before the lime was laid on. In this fituation lime has been applied a fecond time, but its effects found to be far inferior to what they were when firft applied. This is fufficient to convince us, that this manure operates by diffolving the vegetable food which it meets with in the foil, and fitting it for entering the roots of plants.

It is certain, that all kinds of manures open the foil. Any perfon will be convinced of the truth of this, who will take the trouble to compare a piece of land, on which dung, or any other manure has been laid, with a piece contiguous that has not been manured; he will find the one much fofter, much more free and open than the other. It muft be allowed, therefore, that all manures operate by enlarging the vegetable pafture.

Manures are commonly divided into claffes. Some divide them into natural and artificial; others divide them into the foffil, the vegetable, and the animal; and treat of them in order, as belonging to each of thefe claffes.

The manures belonging to fome of thefe claffes, differ both in their nature and operation from thofe in the other claffes. Some of them likewife differ from others in the fame clafs. The dividing them into claffes, therefore, ferves no purpofe. All that is neceffary is, to treat of the different particulars which the farmer can command, without confidering to what clafs they belong.

The manures generally procured are dung, marles, afhes, foot, fea-weed, fhells, fown vegetables, and water.

There are feveral other things that are very rich manures, fuch as rags, leather, &c. But as thefe are to be procured only in fmall quantities, it is needlefs to treat of them feparately.

Dung is commonly ufed to fignify not only the excrement of animals, but alfo all rotten vegetables, when ufed as manures.

Dung is the food by which animals are nourifhed, reduced to a corrupted ftate. The ftomach diffolves the food of the animal, and reduces it to a ftate of putrefaction much fooner than is done by the air. It is by being in this ftate of putrefaction that the juices fit for the nourifhment of the body are conveyed by the guts into the blood. While bodies are in a found ftate, their parts adhere firmly together, and they are incapable of being turned into the parts of other bodies. To render them capable of this, they muft be reduced to their firft principles. This is done by corruption. It is obferved, that by corruption all the parts of bodies are relaxed, and the falts, oils, and other juices which they contain, from being fixed, are made volatile. It is by being reduced to this ftate in the ftomach, that the things which the animal feeds upon become nourifhment to it, and are turned into parts of its body.

All the juices contained by the things which animals feed upon, are not exhaufted by the guts; many of them, along with the earthy part of the food, are thrown out. There is no doubt that fome of the earthy part of the food goes alfo to the nourifhment of the animal; but as the earth is rendered volatile by the falts and oils, there muft be but a fmall quantity of it in proportion to the quantity of thefe exhaufted by the animal; and therefore in the dung there muft be a great quantity of earth in proportion to the other principles. However, as the dung contains all the principles of the food, we may confider the dung of thofe animals that feed on vegetables as vegetables in a putrefied ftate.

Of the fame nature is the dung of animals that feed upon other animals. Vegetables are the original food. All animals either feed on pure vegetables, or on other animals that feed on vegetables. Animals that feed on vegetables are made up of the fame things with vegetables, only under a different form; and therefore the dung of animals that feed upon thefe, is ftill to be confidered as vegetables in a putrefied ftate.

Chemifts inform us, that dung is compounded of the fame principles of which vegetables are compounded, of water, air, oils, falts, and earth. The earth which it contains is of the abforbent kind, and attracts the other principles. They alfo inform us, that dung attracts and ferments with acids, and by this fermentation produces falts. A quality of falt, as was before obferved, is to attract and diffolve oils, and make them capable of being mixed with water.

If thefe qualities of dung are confidered, it will appear that it promotes vegetation in all the different methods before mentioned.

It promotes vegetation by increafing the vegetable food. It is compounded of the fame principles of which the vegetable food itfelf is compounded, as we endeavoured to fhew, when treating of the food of plants. This is alfo confirmed by the experience of all places and all ages; and it is what no perfon will doubt of, who confiders that it has the fame effects upon land of all kinds, and in all fituations.

It promotes vegetation by enlarging the pafture of plants, it attracts acids from the air and foil; and by raifing a fermentation with them, thereby feparates the particles of the foil with which it is mixed. Every farmer knows the truth of this from experience. The land upon which dung is laid, though naturally ftiff, becomes foft and mellow, and is more eafily ploughed than before.

Dung, we have faid, enlarges the pafture of plants, by attracting acids, and fermenting with them. Thefe acids are in the foil and air. They are in the foil; for the foil produces acid plants. Chemifts tell us, that the neutral falt found in foil is compounded of an alkaline falt, fuch as is found in vegetables, and an acid fpirit. All alkalis are ftrong attractors of acids, fo that, in the procefs of an experiment upon foil, perhaps it may be difficult to keep them feparate, though they may exift feparate in it. The acid plants prevent thefe from mixing; or, perhaps, have a ftronger power in their veffels to feparate them, than other plants have.

But though there may be no acids in foil, excepting in the compound of neutral falts; yet there is no doubt, but they are in the air. Chemifts find this by innumerable experiments. Afhes, when expofed to the air, produce neutral falts; the application of acids has the fame effects. Any perfon may obferve a falt adhering to the lime of old walls; this falt is not in the lime, it is produced by the air. The fame falt is produced by acids. Other experiments might be mentioned, but thefe are fufficient.

Dung promotes vegetation, by communicating to the foil a power of attracting the vegetable food from the air. The earth which it contains, is of the abforbent kind, and attracts all the other principles of the vegetable food; and the falts which it contains and produces, attract oils.

It likewife promotes vegetation, by preparing the vegetable food for the nourifhment of plants. By the falts which it contains and produces, it not only attracts oils, but alfo diffolves them, and makes them capable of being mixed with water. It is probable, that oil is a principal part of the food of every plant which we cultivate in our fields, at leaft is the ingredient of which it is eafieft to exhauft the foil, and which it is moft difficult to reftore to it again. In proportion to the quantity of oil contained in any plant, in proportion it robs the foil by which it is nourifhed of its vegetable food. But the nature of oil muft be changed before it can enter the roots of plants. This change is made by falts; they diffolve it, and make it to mix with water.

Though dung promotes vegetation in all thefe ways mentioned; yet, as there are other bodies, that are much ftronger attractors of acids, by which many of its effects are produced; it is probable, that it principally operates by increafing the food of plants. Its effects in diffolving the vegetable food in the foil, muft be very trifling. The falts which it contains and produces, having its own oils to work upon, and being along with them conveyed into the roots of plants, cannot operate with any violence upon the oils which the foil contains. This is confirmed by experience. When the virtues of dung are exhaufted, the foil is no poorer than before it was laid on.

Some new improvers are pleafed to ridicule the old farmers, becaufe they are fo fond of dung; but none will do this who attentively confider the virtues of it. Such other manures as can be obtained, are to be ufed; and tillage is carefully to be attended to: but none of thefe are to fuperfede the ufe of dung, which can be employed to fo great advantage.

Though dung in general has all the qualities mentioned, yet there are fome kinds of it poffeffed of fome of thefe qualities in a higher degree than others. There are as many kinds of dung as there are of animals, and in fome refpects they all differ one from another.

The difference betwixt one kind of dung and another, is commonly fuppofed to arife from the different food of the animals. Green herbage, ftraw, or hay, do not contain fo much vegetable food in the fame quantity as grain does. Hence it is fuppofed, that the dung of cows is not fo rich as that of horfes, nor the dung of horfes fo rich as that of fowls.

But this difference muft partly arife likewife from the nature of the animals, if it is true, that the dung of horfes, cows, fheep, hogs, and geefe, all differ one from another, though fed upon the fame pafture. Some animals digeft their food more quickly than others. This makes a difference in the dung produced by the fame food. Some things are digefted, and turned into a ftate of corruption by fome animals, that pafs through others found and undiffolved. The matter then in the ftomach that digefts the food, muft be different in the different animals. The dung muft partake fomething of the nature of this, which makes another difference in the dung produced by the fame food.

Some writers in agriculture treat of the dung of the different animals feparately. But it is needlefs to do this; for it requires more pains and expence to keep them feparate, and ufe each of them by itfelf, than all the advantages arifing from this way, above the ordinary way, can poffibly amount to.

The dung of fowls, particularly of pigeons, is an exception to this. It is commonly ufed without any mixture, and it can be kept feparate from other dung without any trouble or expence. It is obferved, with refpect to it, that the effects of it are more violent, and fooner over, than the effects of common dung. The effects of fome other kinds of dung would perhaps be the fame, if they were ufed without any mixture. The pigeons dung, being thoroughly corrupted, foon diffolves, and becomes vegetable food. But the ftraw, with which the other kinds of dung are commonly mixed, not being fo thoroughly corrupted, prevents the effects of them from being fo violent, and fo foon over.

The way in which pigeons dung operates, points out the manner in which it fhould be applied. As it is very rich, and its qualities foon exhaufted, a very fmall quantity fhould be applied, in proportion to the quantity of other dung. If care is not taken of this, the crop will be deftroyed by being too luxuriant. Perhaps, mixing it with fome other things may have good effects. The ftrawing fmall chaff of any kind, from time to time, on the bottom of the pigeon-houfe, is very proper. The chaff fucks up the moifture, and makes it eafy to reduce the dung to powder, which is an advantage: for thereby the dung is fcattered more equally, and manures a greater quantity of land.

It is a cuftom, in fome places, to fold fheep and cattle, for the fake of their dung; which, in this way, is ufed without any mixture. Some writers on hufbandry give particular directions how to do this in the moft advantageous manner. But it is needlefs to confider thefe. The farmer muft confult the advantage of his fheep and cattle, and not the advantage of the land by the dung; and, therefore, muft fold them in the moft convenient manner. A fcore of fheep, with the beft management in folding, will not produce much more than ten fhillings worth of dung, in the feafon, above the expence of folding; a fum foon loft by an injudicious management of them.

Dung is commonly mixed with vegetables, and allowed to lie for fome time before it is ufed.

Straw is thrown below the cattle, and this is carried out along with the dung, and thrown upon the dunghill. On the dunghill is alfo thrown all the ftraw that is left after ferving other purpofes, and all the refufe of vegetables and animals, ufed in the farmer's family.

In the management of dunghills, two things are always to be kept in view: the promoting putrefaction; and the preventing the vegetable food from flying off into the air, or being conveyed away by water. The ftraw and other parts of uncorrupted vegetables, of which the dunghill is compounded, make it neceffary to keep the firft in view; and the falts and oils, which by corruption are rendered volatile, and the water, which extracts the virtues of dung, make it neceffary to keep the laft in view.

To promote putrefaction, the fituation of the dunghill fhould be dry, and the dung laid together as thick as is convenient. Putrefaction, indeed, cannot be promoted without water: but the quantity that falls in rain, with the natural fap of the dung, is fufficient for this purpofe. Too much water prevents that fermentation, which carries on the procefs of putrefaction moft quickly. This is confirmed by experience. If there is any part of a dunghill foaked with water, it is obferved that the ftraw is quite found, while, in other parts that are dry, it is completely rotten.

To promote putrefaction, the dung fhould be laid thick together; thereby the heat is the fooner generated, that produces the putrefaction; and thereby the natural fap is the better preferved, which prevents the dung from being burned.

When the natural fap of the dung is exhaled, and the dung afterwards covered, the heat is in danger of rifing to fuch a height, as to burn the dung. This muft be carefully guarded againft: for, when the dung is burned, its ftrength is exhaufted, and it is rendered almoft ufelefs. Dung, in this fituation, is dry and white; the ploughmen call it fire-fanged. When thus burnt, it is found, from experience, that it has loft almoft all its virtues. To prevent the dung from being reduced to this fituation, when it is carried out of the ftable or byre, particularly if there is much ftraw in it, it muft not be laid in heaps, which makes it dry too faft, but carefully fpread thick upon the top of the dunghill. This prevents the fap from being carried off by the wind, and thereby prevents the heat from being raifed to fuch a height as to burn the dung.

It may be obferved, that, when grafs is cut green, and immediately thrown into a heap, it heats, and this heat foon reduces the grafs to a ftate of putrefaction. But, if the grafs is for fome time expofed to the air, and then put together without being fufficiently dry, it heats alfo; but, inftead of being reduced to a ftate of putrefaction, is burned.

burned. So it is with dung: if, when carried out, it is laid in small heaps, being thereby too much exposed to the air, it loses its sap; and, being afterwards covered, the heat is raised to such a height, as to burn it: but, if it is spread thick upon the top of the dunghill, it retains the sap, and putrefies.

A distinction is here made betwixt dung putrefied and burned; and this distinction is represented as important. We know not if the chemists make any such distinction. A late author says, that the greater part of what remains of dung, after the putrefaction is completed, seems to be earth, and a fixed alkali. These things, we apprehend, make up the greater part of what remains, when dung is what we have called burned; but when it is only putrefied, it contains also salts and oils. But though chemists should make no such distinction, it is absolutely necessary that the farmer do it: for, when the dunghill is allowed to heat to such a degree, as to burn the dung, the value of it is thereby greatly lessened.

To prevent the vegetable food from being conveyed away, no foreign water, excepting what falls in rain, must be allowed to run into the dunghill; and the situation of the dunghill, if possible, should be high at the sides, and hollow in the middle. When foreign water is allowed to run into the dunghill, the fermentation is not only stopped, but, as it is often necessary to allow the water a passage from it, thereby much of the vegetable food is conveyed away. When the bottom of the dunghill is quite level, the rain, which sometimes falls in heavy showers, easily finds its way off; but this is prevented by making it high at the sides, and hollow in the middle.

The only way to prevent the vegetable food from being exhaled by the sun, or carried off by the wind, is to cover the dunghill. The covering the dung would certainly be an advantage, if it could be easily executed. If it was not for the additions that are daily made to it, earth would be very proper for this purpose. Some persons assert, that, by covering the dunghill, it would lose the influence of the air; and it is the air alone, they say, that makes it fit nourishment for vegetables; and, therefore, recommend the exposing it, particularly to the north and north-east; because the wind from these points brings along with it more aëreal nourishment than from the others. If the dunghill contained no vegetable food, but what it received from the air, this direction would be very proper: but, as the dunghill contains in itself all the ingredients of the vegetable food, and as its juices, the more it is putrefied, become the more volatile, the vegetable food in it by being exposed to the air, instead of being increased, would be diminished. The covering the dunghill, therefore, would be an advantage. But the difficulty lies in executing this.

Some propose to dig a large pit, lay the bottom with flags, build up the sides with stones, and cover it with a roof. This, it must be owned, will retain the juices, and promote corruption, as well as prevent the vegetable food from being exhaled. But then it must be so expensive, that few will be engaged to make trial, unless the benefits are more obvious than the assertions of the contrivers make them: and, besides the expence, it must likewise be attended with inconveniencies. In some situations, it will be very difficult to prevent too much water from getting into it; and as difficult to get the dung itself carried out.

The method which we proposed for preventing the dung from over-heating, will also, in a great measure, serve this purpose. The dung, when it comes from the stable or byre, is mixed with straw, which absorbs the juices, and prevents them from flying off, till the straw itself begins to putrefy. When, in this situation, it is laid thick upon the top of the dunghill, a small surface only being exposed to the air, and being covered before the straw begins to putrefy, the juices, in a great measure, are preserved. A person, by the smell, is sensible that the juices of the dung are not so volatile, when first laid upon the dunghill, as after they have been covered for some time, and then exposed to the air.

Dung, exposed to the sun and wind, or washed by rain, loses its vegetable food; it ought, therefore, to be ploughed in as soon as is possible, after it is laid upon land. Some persons assert, that they have found from experience, that dung is nothing worse, though it lie a considerable time spread upon land, in dry weather, before it is ploughed in. This, if true, is contrary to what has been supposed, that the vegetable food is exhaled by the sun, and carried off by the wind. It is probable, that, after dung is spread upon land, its fermentation ceases, and the salts and oils remaining in it may become fixed, and may continue so till a new fermentation is raised by mixing the dung with the soil; and that, by attracting acids from the air, more salts may be formed. By this its effects will be more sudden and violent, but sooner over.

It may be proper also to observe, that as the juices contained in the dung are washed downwards by the rain, it should be ploughed in with a very shallow furrow; excepting when the dung is not sufficiently rotten. In this case it requires a deep furrow to cover it.

The better that dung is mixed with soil, the purposes of vegetation are the better answered; all parts of the soil receive equal benefit, the vegetable food is equally distributed, and in all parts the fermentation equally promoted. When dung then is laid on land, it ought to be spread as equally as possible. This likewise prevents the breeding of vermin, which happens in some soils, when the dung is left in too large pieces.

Some are of opinion that lime is only a stimulus, that is, that it promotes vegetation, only by making the soil with which it is mixed, exert itself. Others, that it promotes vegetation by enriching the land, and adding to the quantity of vegetable food.

They first support their opinion by observing, that the crops which lime enables land to produce, exhaust it in a remarkable manner. It is a certain fact, that land thoroughly limed, may be reduced to a much poorer condition by cropping than land can be reduced to, that is not limed. It is possible to reduce limed land almost to a *caput mortuum*; and the better and the oftener the land is ploughed, this is done the sooner.

The other opinion is supported by observing, that, in some places, lime is applied regularly once in four or five years; that the land seldom gets any other manure; that it is kept almost constantly in tillage; and, with the assistance of fallowing, carries very good crops.

From these observations, one is led to conclude, that lime acts both ways; not only makes land exert itself in the nourishment of vegetables, but also enriches it, and adds to the vegetable food.

An inquiry into the qualities of lime will probably illustrate this.

Chemists tell us, that lime has the following qualities.

It is a great dissolver of all animal and vegetable substances: it is a very heavy body: it is an attractor of acids; with these it raises a fermentation, and produces salt; and it communicates its virtues to water.

When these things are considered, it will appear, that lime promotes vegetation in these ways following.

It communicates to the soil a power of attracting the vegetable food from the air. It attracts the acids from the air and soil; these it converts into a neutral salt, by which oils are attracted from the air. This operation of lime is confirmed by the experience of those who use it as a manure once in four or five years.

Lime enlarges the vegetable pasture. By its weight it penetrates the soil; and, by its fermentation with acids, it separates its particles.

This operation of lime is obvious to every person that views with attention any land that is thoroughly limed. It appears soft and mellow, and obviously in a state of fermentation.

Lime dissolves the vegetable food, and fits it for entering the roots of plants. It dissolves all the animal and vegetable substances which it meets with in the soil, and converts them to vegetable food; and, by the salts which it produces, it dissolves all oily substances in the soil; and conveys them into the roots of plants. We find from experience, that lime clears land of root-weeds. This it does by its dissolving power. Root-weeds, when torn up by the plough, have their growth checked, and are for some time in a languishing condition: if lime is applied to their roots while in this situation, by its dissolving power, it is apt to destroy them.

That it is owing to the salt which lime produces by its attracting and fermenting with acids, that it chiefly owes its

its power of promoting vegetation, is confirmed by this obſervation. The lime of old walls which has been long expoſed to the air, and where this ſalt is already formed, is much more ſudden in its operations, when laid upon land, than quick-lime.

It has been obſerved, that lime promotes vegetation by communicating to the ſoil a power of attracting the vegetable food from the air, by enlarging the vegetable paſture, and by diſſolving the vegetable food, and fitting it for entering the roots of plants. It is probable, that the two laſt are the ways by which it chiefly operates.

By this it exhauſts the land of its vegetable food. For it cannot be ſuppoſed to attract from the air a ſufficient quantity of food for the nouriſhment of the crops which it enables the land on which it is laid to carry; and it contains none of this food in itſelf. This is confirmed by experience. If land upon which lime has been laid, is exhauſted by crops, the application of lime a ſecond time has not the ſame effect as before; unleſs the vegetable food is ſupplied by dung, or the land allowed to reſt for ſome years, and have the vegetable food ſupplied by the air.

Thus it appears, that lime from its nature muſt act both as a ſtimulus and a manure; while it makes the earth exert itſelf in the nouriſhment of vegetables, in ſome meaſure alſo enriches it, and adds to the vegetable food.

In ſome lands, the diſſolving the vegetable food, and fitting it for entering the roots of plants, may be moſt beneficial: in others, the communicating the power of attracting the vegetable food from the air, may be moſt beneficial. It will not be improper, therefore, to point out how lime is to be applied, that ſo it may chiefly anſwer the one or the other of theſe purpoſes.

In uncultivated land, in which there is a large quantity of vegetable ſubſtance, lime ought to be uſed chiefly as a ſtimulus: and when improved land needs a recruit of vegetable food, it ought chiefly to be uſed as a manure.

When lime is intended for a ſtimulus, a large quantity ſhould be applied at once. For it takes a conſiderable quantity to diſſolve roots, and the other vegetable ſubſtances in the land, and to produce a high degree of fermentation.

When lime is intended for a manure, a ſmall quantity applied at a time is ſufficient. It is probable, that it requires only a ſmall quantity of lime to impregnate a large quantity of earth, and to communicate to it an abſorbent quality, in as high a degree as it is capable of receiving: and it is certain, that it is in proportion to the abſorbent quality which it communicates, that the ſoil is enriched by it. This is not mere conjecture. It is certain, that a ſmall quantity of lime will impregnate a large quantity of water, and communicate to it all its virtues, and theſe in as high a degree too as it is capable of receiving: it is not improbable, that it may operate in the ſame manner upon earth. If a ſmall quantity of lime communicates an abſorbent quality to a large quantity of earth, but has not ſuch influence in diſſolving vegetable ſubſtances, or in producing fermentation, it follows, that the ſmaller the quantity is which is applied, it will operate the more as a manure; and the greater the quantity applied it will operate the more as a ſtimulus.

It is proper to obſerve likewiſe, that when lime is applied in ſmall quantities as a manure, it is neceſſary to repeat the application frequently; for it is probable, that the ſoil by action loſes the abſorbent quality, which the lime communicates.

Theſe things which we have obſerved concerning the operation of lime in ſmaller and larger quantities, are, in ſome meaſure, confirmed by experience. They are agreeable to the practice in thoſe parts where lime is moſt uſed. When barren land is to be improved, it is laid on in large quantities; and when it is applied to land already improved, it is laid on in ſmall quantities, and frequently once in three or four years.

As lime operates by attracting acids from the air, the longer that it lies expoſed to the air before it is ploughed in, it will exert itſelf the more quickly, and with the greater violence. Some alledge, that this ſhould not be done in ſummer. For they ſay, that the ſun acts contrary to the air: as the air ſupplies the ſalt, the ſun exhales it, and communicates it again to the air.

As lime, when laid on in large quantities, exhauſts land of its vegetable food, it is neceſſary to ſupply this food by dung, or ſuch other manures as have it in greateſt plenty; or the land ſhould be managed in ſuch a manner, as to prevent, as much as poſſible, the vegetable food from being exhauſted. Laying off land, after a very few crops of corn, into graſs for paſture, is the moſt proper way of doing this. Land, when paſtured, has not its vegetable food ſo much exhauſted, as when it carries corn. The quantity of vegetable food carried off in fleſh, by the cattle, or conveyed to the air by their perſpiration, bears but a ſmall proportion to the quantity carried off by a crop of corn and ſtraw.

It is neceſſary further to obſerve, that, as lime communicates its virtues to water, land inclining to be wet, and from which the water has free acceſs away, is not proper for it: for the water, in running off, carries along with it the virtues of the lime.

There are a variety of marles, which are commonly reduced to three ſorts: the clay, the ſtone, and the ſhell.

The firſt has its name from its ſimilitude, in appearance, to clay; the ſecond from its hardneſs, and ſimilitude to ſtone; and the third from the ſhells, with which it is mixed, or rather of which it is compounded.

The clay and ſtone marles are of the ſame nature; the ſhell marle is very different from both. This makes it neceſſary to treat of them ſeparately.

Marle of the ſtone and clay kinds promotes vegetation in a ſurpriſing manner. It is probable, however, that it contains in itſelf few of the principles of which the vegetable food is compounded. Plants are not able to find their food in it. When in a bed below the ſurface, it reſiſts the entrance of water, like till or clay. When near the ſurface, and turned up by the plough in great quantities, the ſoil is little better than till, almoſt quite barren. The method of its operation will be beſt known by inquiring into its qualities.

It is obſerved, that both the clay and ſtone marles have the following qualities.

When long expoſed to the air, or put into water, they fall down into a powder: they are very heavy bodies: the earth of which they are compounded, is of the abſorbent kind: they are attractors of acids; with them they raiſe a fermentation, and produce ſalts.

The only difference betwixt them is this: the clay marle is ſooner diſſolved than the ſtone marle; and commonly has a ſtronger power of deſtroying acids, and producing ſalts. Dr. Home ſays, that the clay marle, which he tried, deſtroyed a third more of acids than the ſtone marle.

Theſe marles ſeem to have much the ſame qualities with lime; and, therefore, muſt operate in the ſame manner.

They communicate to the ſoil a power of attracting the vegetable food from the air, they enlarge the vegetable paſture; and they diſſolve the vegetable food that is in the ſoil, and prepare it for entering the roots of plants.

Theſe marles communicate to the ſoil a power of attracting the vegetable food from the air. The abſorbent earth which they contain, and the ſalts which they produce, are ſtrong attractors of oils.

It is obſerved, that they attract oils ſo ſtrongly, that they are uſed by ſome to extract greaſy ſpots from cloaths. When laid upon land, they will therefore attract oil from the air, which is the ingredient of the vegetable food moſt wanted.

Theſe marles enlarge the paſture of plants. They ferment with acids, and fall down into powder, when expoſed to the air, or put into water. Theſe things make them operate in ſeparating the particles of the ſoil, with which they are mixed.

Theſe marles alſo prepare the vegetable food for being nouriſhment to plants. The ſalts which they produce, not only attract oils from the air, but alſo from the ſoil; diſſolve theſe oils, and render them capable of being mixed with water; and of being conveyed by it into the roots of plants.

According to ſome, theſe marles contain ſome oily matter. This, if true, would make them operate in a manner different from lime. But this is uncertain. The earth of which theſe marles are compounded, is of the abſorbent kind; it cannot be long expofed to the air, without attracting oils; and, therefore, though they contain none in their original compofition, yet fome marks of them may appear upon trial.

Thefe marles are long in diffolving. Large pieces of the ftone marle are feen fometimes undiffolved, fix or feven years after it has been laid upon land. This makes it neceffary to apply a very large quantity of them, otherwife their effects will not be known.

As the quantity of marles applied is very great in proportion to the quantity of lime, land, when manured with marle, muft have a ftronger power of attracting the vegetable food from the air; and therefore the marle fhould be preferred, when it can be as eafily obtained.

As the earth of thefe marles is of the abforbent kind; as a great quantity of it is applied at one time; and as it is long in diffolving, it muft be many years before its operation ceafes; and, if the land is barren, the nature of it will be changed, and ever after, by the fame kind of dreffings it received before, will continue to carry better crops. In this refpect alfo it is preferable to lime. This advantage, however, depends, in a great meafure, upon the nature of the foil. If the foil is foft and fpungy, and has not a firm bottom, the marle, by its weight, will, by degrees, penetrate, like lime, beyond the reach of the plough; and, therefore, muft leave the foil no better than it found it.

Although, in fome refpects, thefe marles feem preferable to lime, yet we are to confider, that their principal operation is the fame with that of lime; which is enlarging the pafture of plants, and fitting the vegetable food for entering their roots. When land, therefore, manured with them, is exhaufted by crops, it cannot receive much benefit from them a fecond time, if immediately applied. This is confirmed, it is faid, by experience. It is obferved, that marle, when applied a fecond time to land exhaufted by crops, has not the fame effect as when firft applied.

As marle operates in the fame manner as lime, it follows likewife, that limed land exhaufted by crops, can receive little benefit from the application of marle; and that marled land, exhaufted by crops, can receive little benefit from the application of lime. As it exhaufts the vegetable food, the proper manure after it is dung, which contains this food in the greateft plenty.

It was obferved, that marle operates chiefly by attracting oils and acids from the air; the longer, therefore, that it lies upon land, expofed to the influence of the air, the more quickly it will operate.

The difference betwixt the clay and ftone marles was faid to confift in this: that the clay marle diffolves fooner, and has a ftronger power to deftroy acids and produce falts. This kind is therefore preferable, as a lefs quantity will produce the fame effects. If Dr. Home's experiments are to be depended upon, or rather, if all clay and ftone marles have the fame powers with thofe which he made his experiments with, then four cart-load of the clay marle is equal to five of the ftone.

What was faid of lime, with refpect to the application of it in fmaller and larger quantities, may likewife be faid of marle. When barren land is to be improved, the marle fhould be laid on in large quantities: but when land is in good order, the applying a fifth or fixth part of the quantity commonly ufed, once in fix or feven years, may have very good effects.

Shell marle is very different in its nature from the other two. It is commonly claffed among the animal manures.

It does not diffolve with water, as the other marles do. It fucks it up, and fwells with it, like a fpunge. It is a much ftronger attractor of acids than they. Dr. Home fays, that it takes fix times more of acids to faturate it than any of the other marles which he had met with. But the greateft difference betwixt the fhell marle and the other marles confifts in this. The fhell marle contains oils. It is uncertain whether the other marles contain any oils; but this kind, it is faid, contains them in great plenty.

This marle, it would feem, from the qualities which it poffeffes, promotes vegetation in all the different ways. It increafes the food of plants; it communicates to the foil a power of attracting this food from the air; it enlarges the pafture of plants; and it prepares the vegetable food for entering their roots.

It increafes the food of plants by the oils which it contains, and the falts which it produces: by thefe falts, and by the abforbent quality which it poffeffes, it communicates to the foil a power of attracting this food from the air. It enlarges the pafture of plants, by its fwelling with water, and the fermentation which it occafions; and it prepares the vegetable food for entering the roots of plants, by the falts it produces in fermentation.

It will not be improper to attend to the effects of thefe different operations. The communicating vegetable food immediately to the foil, and communicating to it a power of attracting this food from the air, have the fame effects. By both thefe operations the vegetable food is increafed.

The enlarging the pafture of plants, and fitting the vegetable food for entering their roots, have alfo the fame effects. By both the vegetable food is diminifhed. It is obvious, that, by thefe operations, plants are affifted in extracting this food from the foil.

The oils which it contains, it is probable, are foon exhaufted: having a ftrong power of attracting acids, and forming falts, it is natural to fuppofe that thefe falts do more than work upon its own oils: they will alfo attract and diffolve the oils which they meet with in the foil; and would exhauft it of the vegetable food which it contains, was it not for the ftrong abforbent quality which it communicates. This quality, it is probable, remains after the operation of the falts is over; and thus, upon the whole, the foil is rather bettered by it.

We had occafion to fhow, that the difference betwixt poor and rich foil confifteth in the different powers of attraction. As this marle has fo ftrong an abforbent quality, if it is applied in large quantities, and frequently repeated, it is poffible that it may communicate fuch an attractive power to the foil, as to enrich it in a very high degree, fo as to need no further manuring, but by proper tillage may be made to attract from the air in the winter-feafon fuch a quantity of vegetable food as is fufficient to nourifh a crop in fummer.

As this kind of marle does not exhauft land of its vegetable food, as the other marles, or as lime do, it may be applied to land exhaufted by them, or it may be repeated. As it diffolves fooner than the other marles, its effects will be more fudden, and as it does not diffolve fo foon as dung, its effects will not be fo foon over.

A late author fuppofes, that the marle found below mofs is compounded of earth and the alkaline falts of rotten wood. He explains in what manner he imagines it is formed. If there is a marle compounded of thefe ingredients, it is different from any of the marles that have been mentioned. However, it will operate much in the fame manner. It will communicate a power to the foil of attracting the vegetable food from the air; it will enlarge the pafture of plants, and it will prepare the vegetable food for entering their roots.

As it contains a large proportion of falt, its effects will be fudden and violent. It is not proper therefore that a great quantity of it fhould be applied.

As its effects are fudden and violent, it cannot be expected that they will laft long. It is probable that they will be foon over after it is entirely diffolved.

The falts which it contains, will make it operate chiefly in diffolving the vegetable food in the foil, and fitting it for entering the roots of plants. By this it will exhauft the foil, if care is not taken to prevent it, by the application of dung, or turning the land from tillage into grafs for pafture.

There is another kind of marle that goes under the name of fhell marle, and in fome parts of the country is found in great plenty. It feems to be almoft wholly lime, and it operates in the fame manner.

Afhes contain a large proportion of falt; they attract acids more violently than any other thing as yet known, but they foon lofe their virtue.

The effects of afhes will then be of the fame kind with lime. But as afhes contain falt, their operation will be more fudden; as they attract acids with greater violence, and fooner lofe their virtue, their operation will be more violent, and fooner over. This is confirmed by experience. The firft crop after land is manured with afhes is commonly very luxuriant, and the fecond crop exhaufts almoft the whole of their virtues.

As the effects of afhes are fudden and violent, they fhould be applied in very fmall quantities; and as they operate

rate in the fame way with lime, they fhould not be applied to land exhaufted by lime or marle; fhould not be followed by thefe, nor repeated.

Turf is compofed chiefly of vegetables; that which remains then after burning, muft be of the fame nature with afhes. To thefe the fertility communicated to the foil is chiefly owing. It is found from experience, that in proportion to the number of roots contained in the turf the burning turns out to advantage; and therefore land, with a tough fward of grafs upon it, is recommended as the kind moft proper for being improved in this manner.

The heat which part of the foil receives from burning the heaps of turf is fuppofed to contribute to its fertility: but this can have little influence except to deftroy any feeds or roots of weeds that may be in the land.

In burning the turf, care muft be taken to cover the heaps in fuch a manner as to prevent the fire from breaking out into flame. Where this happens, it is obferved, that the afhes lofe part of their virtue, and that the parts of the field manured by them are not fo much enriched as the other parts are by the heaps of turf that are burned without flame. It is natural to think, that the earth of the turf, when properly piled up, will retain the oils of the vegetables, and prevent them from afcending into the air in fmoke and flame.

This makes fome difference betwixt the manuring by burning and the manuring by afhes. However, as the oils contained in burned turf are in very fmall quantities, we may well fuppofe that they will foon be exhaufted by the falts; and therefore, though the effects of burning may be more violent, yet will be equally fudden, and as foon over.

To prevent burnt land from being exhaufted, one crop only, or two at moft, fhould be taken, and then turned into grafs for pafture. If a little dung is added after the firft crop, its fertility will be the longer preferved.

Soot cannot be procured in fuch large quantities as to be ufed by itfelf, excepting in the neighbourhood of large cities; it is needlefs therefore to infift much upon it.

It contains oil, falt, and earth. Thefe, it feems, are compounded in fuch a manner as to be ready to be conveyed into the roots of plants by water. For the effects of foot, when fpread upon the furface, are difcovered immediately after the firft rain. It promotes vegetation in the fame manner as dung, or fhell marle. It increafes the food of plants by the ingredients of the vegetable food which it contains. It enlarges the pafture of plants, enables the foil to attract the vegetable food from the air, and prepares it for entering the roots of plants by the falt that it contains, which is of the alkaline kind, attracts and ferments with acids, and attracts and diffolves oils.

As it contains great plenty of vegetable food, and as its effects are fudden, it muft be laid on in very fmall quantities. Sowing it in the fpring on winter corn or grafs, feems to be the moft proper way of ufing it.

When the quantity laid on is but fmall, and its effects fudden, it cannot be fuppofed to laft long. Its virtues are commonly exhaufted by one crop.

When its effects are over, the foil is left in the fame fituation as before it was laid on, not exhaufted of its vegetable food, as by lime or afhes; and therefore it may be repeated; or it may be followed by thefe manures, as it is very proper to be applied to land that is exhaufted by them.

All the plants that grow upon the rocks within reach of the fea, are good manures. Thofe that grow upon the rocks that are almoft always covered by the water, are the richeft.

Some kinds of fea-weed are burnt for kelp. This, it is thought, turns out to greater advantage than ufing them as manures. The beft kinds for manures cannot be reached, as their roots are almoft always below water; but they are frequently driven on fhore by the fea. A confiderable quantity of them may always be expected on the fhore in the neighbourhood of the rocks, where they grow, when a fpring-tide, heavy rain, and a high fwelling fea all happen at the fame time. The fpring-tide expofes their roots to the air, the frefh water falling in rain loofes the roots, and the high fwelling fea tears them up. Sometime the tide carries them to a confiderable diftance.

They are of a foft pulpy nature, eafily diffolve, and foon putrefy; and they contain oil, falt, and earth. They muft promote vegetation therefore in the fame manner as dung or foot.

Their effects are fooner over than thofe of dung mixed with vegetables from a dunghill; for they fooner diffolve and fooner putrefy.

They may be applied to foil in any fituation, and are very proper for land that is exhaufted by lime or afhes.

When their effects are over, the land is in no worfe a fituation than before they were applied, and any kind of manure may be applied after them.

The oftener they are applied, the land becomes the richer; for the earth of which they are compounded, is of the abforbent kind. This is confirmed by experience. The land near the fhores, where thefe fea-weeds are in greateft plenty, and have been long ufed as manures, are amongft the richeft in Scotland, and have been kept almoft conftantly in tillage.

They are preferable to dung in this refpect, that they do not produce fuch a quantity of weeds. Every perfon that has ufed thefe manures, knows, that weeds do not appear in fuch plenty upon land manured with fea-weed, as upon land manured with dung. This feems to confirm the opinion of thofe, who affert, that the great quantity of weeds that appear upon dunged land, are produced by feeds mixed with the dung. But it is fubmitted, whether this difference is not owing to the great quantity of falts contained in the fea-weed and applied with it, which at firft deftroys fome of the feeds and roots of weeds. Salt, applied in too large a quantity, is undoubtedly a poifon to many plants. According to Mr. Tull's experiments, a fmall quantity of falt water deftroyed a plant of mint. It is obferved likewife, when any grafs upon the fhore is overflowed by a fpring-tide, it withers away in a few days, and does not recover till it gets a plentiful fhower. Then indeed, by the frefhnefs of its verdure, it is diftinguifhed from the grafs that was not overflowed by the falt water. That it is the falt in the water that deftroys the plants, is obvious: for the fame quantity of frefh water would have had no fuch effect. And it is probable, that the oils attracted by the falts, and carried down by the rain, is the caufe of their recovery.

In many places, particularly near the fea-fhore, broken fhells are found in beds. Thefe are ufed by fome as a manure.

They ferment with acids, and, like other animal fubftances, contain oil, falt, and earth. The oil and falt are not in great quantities in proportion to the earth, and they take a long time in diffolving.

Their operation muft be of the fame kind with that of fhell marle, but flower and weaker.

They make fome addition to the vegetable food by the ingredients of this food of which they are compounded. They communicate to the foil a power of attracting this food from the air; and they diffolve it by the falts which they contain and produce. And they increafe the pafture of plants by their fermentation.

They operate chiefly by enlarging the pafture of plants, and preparing the vegetable food for entering their roots. They are fo long in diffolving, that the quantity of oil communicated in a feafon muft be fmall in proportion to the falts which they produce. Though thefe are their principal operations, yet in them they are inferior to lime, marles, or afhes.

As they take a long time to diffolve, and do not operate quickly, it is neceffary to apply them in large quantities. For without this their operations will fcarcely be perceptible.

For the fame reafon it may be expected they will continue for a confiderable time. They will continue till the fhells are wholly diffolved, and all their oils exhaufted in vegetation.

As they operate chiefly by enlarging the pafture of plants, and fitting the vegetable food for entering their roots; they will in fome degree exhauft the land of its vegetable food, though not fo much as lime or afhes do, as they communicate fome oils to it in diffolving. It is not proper therefore to apply them after lime or afhes, to repeat them immediately, or apply lime and afhes after them.

If

If they are taken up from below the furface, as muft happen moft commonly, it is proper to allow them to lie fome time expofed to the air before they are ploughed down. This will not only affift their fermentation, but will alfo promote their putrefaction.

As lime, when mixed with them, takes a very ftrong band, it is probable, that the mixing them together in the application may in fome cafes produce very good effects.

It is a practice in fome places to fow turnip, buck-wheat, peafe, &c. on land; and when grown up, to plough them down for manures.

Thefe may be called vegetables in an entire ftate, to diftinguifh them from dung made of putrefied vegetables; though no vegetable can be a manure till it is putrefied.

As thefe vegetables receive their food from the foil on which they grow, it is natural to think, that when ploughed down, they do no more than reftore what they have taken; and therefore, that by this operation land cannot be rendered more fertile than before; at leaft, cannot communicate fuch a quantity of vegetable food to it as may be done by frequent ploughings. For the vegetables, though ploughed down, are not all preferved; a part of them being uncovered, is blown away by the winds. Befides, the plants while growing cover the furface, and prevent the vegetable food in the air from entering the foil. Whereas, when land is frequently ploughed, none of its vegetable food is exhaufted, and it is expofed to receive all the benefits from the influence of the air. But, notwithftanding this, fome affert from experience, that a crop of fuch vegetables as thofe mentioned, ploughed down, render land more fertile than frequent ploughings without the application of manure.

To account for this upon the principles eftablifhed, let the following things be confidered.

The foil, manured by ploughing down a crop of vegetables, receives all the vegetable food contained in the feed fown. This quantity in peafe and buck-wheat is not very inconfiderable. The quantity in one grain is probably as much as there is in a whole ftalk after the feed is fully ripened. It is obferved, that plants, when cut green, exhauft land of its vegetable food, but in a very fmall degree to what they do when allowed to carry feed.

Some of the plants mentioned pufh down their roots below the reach of the plough, and bring up the vegetable food lodged there to the furface. Peafe, turnip, clover, and other plants pufh down their roots very far; and whatever vegetable food they find, is fucked up; and when they are ploughed down, this vegetable food is lodged near the furface, and thereby the quantity within the pafture of fome other plants, fuch as wheat and barley, is increafed. A late author makes a calculation of the quantity of vegetable food which clover in this manner communicates to land, and reprefents it as very confiderable. In few places the foil is fo deep as to have the vegetable food in great plenty beyond the reach of the plough; and therefore it is probable, that this author, in his calculation, makes the quantity of this food brought near the furface by clover much greater than it really is. However, it is certain, that as plants pufh down their roots below the reach of the plough, they there find nourifhment, which is communicated to their ftems and leaves; and therefore, when thefe are ploughed down, the quantity of vegetable food near the furface is increafed.

The covering of the furface feems to be an advantage; for thereby the air in the foil, not having a free communication with the external air, becomes putrefied, by which a fermentation is raifed, and the vegetable pafture enlarged. Whatever is the caufe of this fermentation, the fact itfelf is obvious. Every farmer knows, that when the foil has been covered for a confiderable time by a ftrong crop of peafe, or any other kind of corn laid down, and what is commonly called flooming, though naturally hard and ftiff, becomes mellow, foft, and free, and obvioufly in a ftate of fermentation. It is probable, that this is occafioned by the corruption of the air, or of the water, which the covering of the furface prevents from being exhaled.

To thefe things it may be added, that it is not impoffible but the plants when growing may fuck in the vegetable food from the air in as great plenty as the foil would have done, though there had been no plants growing upon it. If plants have this faculty, confidering what an immenfe furface is expofed by them to the influence of the air, the quantity of vegetable food acquired cannot be inconfiderable.

Having thus confidered the effects of ploughing, harrowing, rolling, and manuring land, in order to produce a large crop of wheat, we fhall now proceed to the cultivation of the ufeful fpecies of grain.

It has been very juftly obferved by the ancients, as well as moderns, that wheat will grow in almoft any part of the world, and that, as it is the plant moft neceffary to mankind, fo it is the moft general, and the moft fruitful. It thrives not only in temperate climates, but alfo in very hot, and very cold regions; and, when fown in places where it never grew fpontaneoufly, fucceeds as well as where it has been always common. The fuccefs of our crops of wheat in America plainly prove this: and in Peru and Chili in particular, where this grain was not known till the Europeans introduced it there, it now produces as large crops as in moft parts of Europe.

Wheat fhould be fowed in autumn, and always when the ground is moift. In the downs of Hampfhire, Wiltfhire, and Dorfetfhire, farmers begin to fow their wheat in Auguft, if any rain has fallen, and even employ their people to fow one place, while they reap another, if wet weather interrupts them in their harveft: for if the corn is not forward in autumn, fo as to cover the ground before winter, it feldom does well on thofe high dry lands, efpecially if the enfuing fpring prove likewife dry. In low ftrong lands, fome hufbandmen think they are in good feafon, if they get their wheat into the ground by the middle of November; nay, it fometimes is Chriftmas, or even later, before all their wheat is fown. But this late fown wheat, befides being apt to run too much to ftraw, efpecially if the fpring be moift, is liable to be thrown out of the ground by frofts.

In general, all wheat fucceeds beft upon ftrong foils, efpecially if they have been well drained, fo that the corn lies dry: but as fome forts of this grain thrive better in fome foils than in others, it might redound to the public welfare if more particular obfervations were judicioufly made, in regard to each kind, than have hitherto been. The white egg-fhell wheat is reckoned beft for light lands, and to fow with rye for meflin; becaufe it ripens fooneft. It fhould alfo be the earlieft in the ground. This fpecies is much fown in Effex, upon their hazely brick-earths, or loams; as the red-wheat, and the Poland bearded wheat alfo is there, and in Hertfordfhire upon ftiff yellow clays. The white Poland, or pole-rivet wheat has not a hollow ftraw, and therefore is not fo fubject to lodge as other corn that has. This kind is particularly fit for lands where the crop is apt to run much to ftraw.

In Oxfordfhire, they have a fort of wheat which they call long coned-wheat, and reckon the beft for rank clays. Its ftraw not being hollow, it is the lefs liable to lodge, and farmers obferve that it is the leaft apt to be mildewed, or be eaten by birds, from which laft it is greatly guarded by its long rough awns; but the flour of it is fomewhat coarfe. Their white kind of red eared wheat has a white ear and a red grain, and is a very good fort for clayey land. It yields a good crop, and feldom fmuts.

In Staffordfhire, they reckon the red Lammas or bearded wheat the beft for cold lands or ftiff clays.

In Berkfhire is a wheat called pendulum-wheat, from the hanging of its ear, much like the cone-wheat.

In Northamptonfhire, they have a fort of wheat with a white ftraw and reddifh ear and grain; much commended for the plumpnefs and largenefs of the grain, and the ftrength of the ftraw, which prevents its being fubject to lodge; nor is it apt to be eaten by birds. They have alfo a red eared bearded wheat, and a fort of pollard or duck-bill wheat, as it is called, known in Suffex by the name of fuller's wheat, which has fo clofe and thick a hufk, that the birds never injure it. Mr. Miller obferves that this fort of wheat grows very tall, and, if it be fown too thick, is very apt to be lodged by rain and wind; for that its ears are large and heavy, and incline on one fide as the grain increafes in weight; but that, if its roots are at a proper diftance from each other, it will tiller greatly and have ftrong ftalks, and that the grain of this wheat yields more flour in proportion than that of any other sort. The awns of this wheat always drop off when the grain is full grown.

Smyrna wheat, commonly called many-eared wheat, because several lesser or collateral ears grow around the bottom of the main ear, which is very large in its state of perfection, requires more nourishment than the common husbandry in the large way can give it, and therefore is not cultivated by our farmers: but it would, probably, do extremely well in the horse-hoeing husbandry, where the quantity of food can be enlarged almost at pleasure. For the same reason maiz, commonly called Turky or Indian corn, is fittest for this last husbandry. *See* MAIZ.

Some gentlemen have been curious enough to procure their seed wheat from Sicily, and it has succeeded very well as to the growth: but the grain of this species has proved too hard for our English mills to grind.

The best time for sowing wheat is about the beginning of September, especially if any rain has fallen; a circumstance so essential, that, if the earth be very dry, the farmer had better stay till friendly showers have moistened his soil, than put his corn in ground where it will not grow before it has been wet, let the time be every so long. Mr. Mortimer says he has known wheat to be so mustied and spoiled by laying long in the ground, before rain came, that it has never grown at all: to which he adds, that he has likewise seen very good crops of wheat from seed sown in July. At all events, the husbandman should certainly have his wheat sowing finished by the middle of October. Whoever neglect this, shews in so doing, a want of proper œconomy in his affairs, and will have cause to repent the delay.

Early sowings require less seed than late ones, because the plants then rise better, and acquire strength to resist the winter's cold. More seed should always be allowed for poor lands than for rich, because a greater number of plants will perish on the former. Rich lands, sowed early, require the least seed of any.

Another circumstance which the husbandman should carefully attend to in sowing, is that his estimate of seed be formed, not from the capacity of any particular measure, but from the number of grains which that measure will contain; because the grains of some growths of wheat are much larger than those from off other lands, though of the same species, and perhaps equally good. By not considering this, the ground will of course frequently be sown too thick, or too thin: though I believe farmers are seldom apt to run into this last extreme. That they too often commit the former error, so manifestly contrary to their interest in every respect, is demonstrated by reason, and by daily experience:—but neither of these is sufficient to make them deviate from the beaten tract. Instead of the usual allowance of three bushels of seed wheat to an acre of land, repeated trials have shewn that half that quantity is generally more than sufficent: consequently a great deal of corn is actually thrown away; for the expence of purchasing seed, which most skilful husbandmen do, at least every other year, amounts to a considerable article in large farms, and in a whole country, merits the attention of the public, especially in scarce years: besides which, the future plants, crowded together by being thus sown too thick, and not having a sufficient space allowed them for their sustenance, cannot yield near so fine and plentiful a crop as they would otherwise produce. A fair trial, made with proper care, would soon convince farmers of their error in this respect; for if they but examine a field of corn sown in the common way, they will find few plants with more than two or three stalks, unless by chance, where some of them stand so as to have room to spread. These will have six, eight, or ten stalks, and frequently many more; but a field of wheat sown with only a bushel of good corn has been known to be well covered with healthy vigorous plants, each of which has had from six to fourteen, or more, stalks, crowned with long well nourished ears, full of fine plump grain, of which it has yielded a much greater quantity than any of the neighbouring grounds sown with the common allowance. If the land is good, and the plants stand at a proper distance from each other, few of them will produce less than the above number of stalks and ears. But farmers think they shall have no crop if the ground is not covered with the blades of corn by the spring: whereas, if they would have patience to wait till the plants put out all their stems, they would be amply convinced of the contrary. Every one must have observed in places where foot-paths are made through corn fields, that, by the side of those paths, where the corn is thin, and has been trodden down in the winter and spring, the plants have stood erect, when most of the corn in the same field has been laid flat upon the ground; an advantage which can proceed from no other cause, than that their stalks are stronger from their having more room: for those of the other plants are drawn up tall and slender by being too close together.

More seed is commonly sowed upon new broke up ground, than upon that which has been longer in tillage. From half an inch to three inches is the usual depth at which wheat is planted, according to the nature of the soil; the stiffest lands requiring the shallowest sowing, as was before observed. The general custom is, to sow it under furrow, which is certainly most adviseable if the soil be shallow, to prevent the plants being thrown out by the winter's frosts, or their roots being left bare by the drying winds in the spring. Some sow in broad cast, either with a single cast, or a double bout, harrowing once between; after which the ground is again harrowed several times, till the seed is well covered. However, a great deal of it will become the prey of birds, in this manner of sowing. On the other hand, in planting the corn deep, there is the greater dander of its being eaten off by worms between the grain and the blade.

Great care should be taken to guard against the rooks just at the time when the wheat is shooting up. These mischievous birds perceive its sprouting much sooner than the farmer can, and are led by the shoot to pick it up. They must therefore be carefully kept off the ground for a week or ten days at this season; for at the end of that time the blade will be grown up, and the grain so exhausted of its substance, that they will not give themselves any trouble about stealing it. They never molest the wheat which is sown about Michaelmas; because so much grain of the late harvest then lies scattered about the fields, that they find it easier to pick up that, than to search for corn under ground, in the new-sown lands.

No part of husbandry requires the farmer's attention more, than keeping his land free from weeds; yet few trouble themselves much about this essential article, are sensible of it's importance, or understand the proper method of doing it: nay, many do not even know which weeds are annual, and which perennial; a distinction highly necessary to be made by every person who would keep his ground clean and in good order, and without which the greatest industry will often be baffled. Annual weeds may be soon destroyed, if taken in time: but if they are neglected, their seeds will ripen, and sow themselves in such abundance, that much additional labour and expence will be required to do that which might have been performed with ease at the beginning, without subjecting the corn to be robbed of its nourishment by bad neighbours. The common method of weeding is very absurd: for in that practice the weeds are left to grow till the wheat begins to ear, and they are in flower; by which means, the ground being covered by the corn, all the low weeds are hid, left to ripen, and scatter their seeds: only the tall weeds are taken out; and if the people employed are not careful, many of these will escape them, by being so intermixed with the stalks of the wheat, as not instantly to be distinguished. At the same time great numbers of the plants of wheat are broken and trod under foot by the weeders.

To obviate these inconveniences, Mr. Miller recommends the method now practised by good kitchen gardeners, who clear their ground with a small kind of hoe, which, if used among the wheat early in the spring, before the ground is covered by the blades of corn, will effectually eradicate all the weeds, especially if this work be done in dry weather; because, being small, they then soon wither and die. If the ground happens to be very full of weeds, it may be necessary to go over it a second time, about a fortnight after the first, to cut up those which may have been too small to be noticed. By this means the corn will be kept clean, freed from robbers which

which would deprive it of due nourishment, and there will not be time for new weeds to grow so as afterwards to do it any great prejudice: for the ground will be so much shaded by the corn, that the weeds will thereby be kept down, in such manner as not to ripen their seeds before harvest.

If, at the time of this operation, some of the plants of corn are cut up where they grow too close, the rest will be greatly benefited thereby: "but in this, adds Mr. Miller, I fear that few of the old farmers will ever agree with me, though what I mention is not from theory, but from experiments, repeated with great care, and such success, that the produce of twenty rods of ground was much greater, both in weight and measure, than that of the same extent in the very best part of the field, where this was not practised; and the stalks of the corn thus thinned stood upright, when a great part of the crop in the same field was lodged."

Both the advantage of having the plants of corn at proper distances from each other, and that of keeping them quite free from weeds, too difficult, not to say almost impracticable, tasks to be completely effected in the common method of sowing, are fully obtained in the New Husbandry, as will soon be evidently shewn.

M. Duhamel and Mr. Miller justly blame the practice of those who either turn hogs in among their wheat, to destroy part of it when it grows too thick; or sheep to eat it down, when they think it too rank. The absurdity of the former is self evident: and in regard to the latter, it is well known, from long experience, that the leaves, or blades, of corn are necessary to draw in nourishment from the air and dews, for the increase of the stalk and ear. To be thoroughly satisfied in this, Mr. Miller cut off the leaves of some plants of wheat, alternately, early in the spring, and always found the stalks of these plants much smaller, the ears shorter, and the grain poorer, than those of the intermediate plants whose blades were not cut. Several experiments made by M. Duhamel have proved, not only that all plants are impeded in their growth, and rendered less perfect in their productions, but often even killed, by stripping them of their leaves: and this is confirmed by Mr. Miller, who adds, that he has frequently observed in gardens, that plants divested only of their lower leaves, plucked off by ignorant persons upon a supposition of their drawing the nourishment from the head, have been greatly weakened thereby. The same will undoubtedly hold good with respect to corn; besides which, cattle, and particularly sheep, will often bite so close as to destroy the crown of the plant, from whence its future growth should proceed.

Wheat is ripe when its straw is turned yellow, its ears hang, no greenness appears in the middle of them, and the grain is hard when bitten. From four to five quarters is reckoned a good crop: but some would hardly credit how much beyond this the produce of good ground, thoroughly well cultivated, may be increased. Those who are sensible of the vast advantages of a perfect culture, will not be surprised at Mr. Miller's assuring us that he has known eight and ten quarters, and sometimes more, reaped from an acre, over the whole field, where the corn has stood thin upon the ground; and that he has been informed by persons of great credit, that even twelve quarters have been reaped from an acre of land drilled and managed with the horse-hoe.

Both wheat and rye may be cut somewhat before they are throughly ripe, especially if they be lodged; for if the straw be broken, it will no longer convey any nourishment to the grain. M. Duhamel seems to think this even the most eligible way for wheat, because the grain will harden afterwards in the sheaf; whereas, if it be let stand till it is too ripe, it will shed greatly in cutting, binding, and carrying home. It is partly to prevent this inconvenience, that good husbandmen tie it in the evening, and carry it off early the next morning. The ancients reaped their corn before it was full ripe, as Pliny informs us. And indeed it must be allowed that very great disadvantages necessarily attend the letting of some sorts of corn stand till their grains have acquired their utmost maturity. Both the chaff and the fodder are the worse for it; and, if such ripe corn takes wet, the increase in malt is lost, if it be barley, it having already spent itself; and if it be wheat, the quality of the flour is greatly impaired, as well as the quantity considerably lessened. But if corn be cut greenish, it will bear a pretty deal of wet without damage; for it will not imbibe the water like full ripe corn, but only take in so much as to be kindly fed thereby. Again, if any sort of corn be blighted, the sooner it is cut down, though but half ripe, the better it will be; for nourishment can no longer be conveyed to it by the straw; but it will be fed by lying in the ear. The straw would become more and more brittle, by standing till the corn is ripe; and the grain comes the clearer from the husk, when threshed, if this blighted sort be cut early.

One man, with a binder, may reap an acre of wheat, and somewhat more of rye, in a day, if the corn stand well: he will also clear about an acre of peas, vetches, &c. in the same space of time.

The medium price of wheat, in this country, is about five shillings the bushel. If it be much under four shillings, the farmer cannot pay his rent and live; and if it exceeds six shillings, the poorer sort of people cannot afford to purchase wheaten bread. A bushel of wheat weighs from fifty-six to sixty pounds; a bushel of barley, from forty-four to forty-seven pounds; and a bushel of peas, from sixty-three to sixty-six pounds.

"The husbandman, says M. Duhamel, cannot have a more favourable season to get in his harvest, than that which is afforded him by hot and dry weather: for the quality of the corn is improved, and the grain is rendered much fitter to keep, by the sun's having acted powerfully upon it, either towards the latter part of its standing, or just after it has been cut: though it is true, on the other hand, that this very circumstance renders the ears more apt to shed their grain, and that the value of a sowing is often lost thereby. To prevent this, as much as possible, the corn is first laid in gripps, and then tied up in sheaves, in the cool of the evening, or early in the morning before the heat comes on; and the mowers of oats frequently work during part of the night, to avoid the excessively fatiguing sultriness of the noon. These poor people, whose task is infinitely laborious, are liable to many grievous disorders; especially the reapers, who, being obliged to stoop to their work, almost to the very point where the rays of the sun are most violently reflected by the earth, breathe a perfectly burning air. This forces them to drink copiously of liquors, which, being heated by the sun, allay their thirst only for a few moments, and, I strongly suspect, often occasion severe illnesses: the inventing of a machine, engine, or instrument, by which the hardness of this labour might be mitigated, would therefore be a truly useful discovery; and I most heartily exhort all ingenious persons who have a mechanic turn, seriously to think of it.

"The two usual ways of cutting corn, are either with the scythe, or with the sickle. The former is commonly used for oats and barley, or, sometimes, for very thin, short wheat; and the sickle is generally appropriated to the reaping of tall and thick wheat and rye. The scythe dispatches so much more work than the sickle, that the difference of expence between reaping an acre, or mowing it, is nearly in the proportion of five to two.

"Every part of the mower's body labours and fatigues, and his work requires greater dexterity than that of the reaper: but as the mower is always in a kind of standing posture, he has the advantage of being refreshed by every breeze of air; which the reaper, for the reasons beforementioned, has not.

"I do not despair but that some engine may, one time or other, be found out, to ease these very hard labourers, and expedite their work. In the mean while, I am persuaded that M. de Lille's following account of what he himself has practised on his own estate, will afford satisfaction to all my readers, who will be pleased to observe, that he does not relate matters of mere speculation, but real facts; things actually executed by him, and which I should certainly have tried, if I could possibly have been in the country when our harvests were got in.

M. De Lille's account of his method of mowing wheat.

"When I first put a scythe into my corn, I was of course laughed at by some of my neighbours, because they had never seen any such thing. I let them enjoy their jokes; but persevered in my undertaking, which I have now

now practiſed ſufficiently to be able to point out minutely its advantages, and its inconveniences; for I allow that, though the former are very great and numerous, it is alſo attended with ſome of the latter.

" The year 1751 was very rainy; our graſs rotted upon the ground, our corn was poor and infeſted with weeds; and the weather continued extremely bad during all the harveſt ſeaſon. One of my fields of wheat, containing about fifteen acres, was, in particular, in ſuch wretched plight, that I did not think the crop worth taking off. However, after walking over it, and viewing it on every ſide, I found that the quantity of graſs and other growths upon it, might, if mowed, afford a great deal of fodder, which would make me ſome amends for the total loſs of my lucerne. I therefore determined to let my horſes have it all, with the little wheat which appeared here and there. This firſt made me think of mowing a field of wheat; tho' I ſoon recollected that I had met with the hint before, in ſome of your writings. Accordingly, I ſet my mowers to work: my field yielded a great quantity of fodder; the graſs, mowed within two inches of the ground, ſhot up anew, and afforded excellent paſture; and laſtly, my bailiff, more ſaving than I had been, ordered the truſſes to be thraſhed, and got out of them as much wheat as was yielded by other grounds.

" Whilſt I was congratulating myſelf upon the ſucceſs of my operation, by which my horſes and cattle were provided with plenty of fodder for the next winter, I learnt that the huſbandmen in Hainault, Flanders, Artois, and other adjacent parts, never cut their corn down otherwiſe than with a ſcythe; but at the ſame time I was informed, that they do not mow wheat in the ſame manner as oats; that the ſcythes are not made alike for both theſe works, and that there are ſome other eſſential differences.

" Theſe obſervations were a ſort of proof that the practice had been found to anſwer, ſince it was ſtill continued; and I concluded, that if my operation, imperfect as it was, had ſucceeded ſo well, I might expect far greater advantages when it ſhould be performed regularly: but, not to be too ſtrongly prejudiced in its favour, I reſolved to make a trial upon about thirty acres only.

" By dint of inquiry, I found within a few miles of me a huſbandman who came from the province of Artois, and had been uſed to this very buſineſs. I talked with him; he told me how the work ought to be done, pointed out its advantages, and I retained him for my intended next year's mowing of wheat: but as the ſeaſon was pretty far advanced, and there was not time to procure from his country other people equally well acquainted with the practice, to follow the ſcythe, and do the whole completely in every reſpect, he inſtructed two young lads, as well as he could. In ſhort, nothing was wanting but a mere matter of form, by the neglecting of which ſome of the lifts of the cut corn were miſplaced, ſo that there were ears at both ends of the ſheaf.

" I ought not here to forget the clamour raiſed by this novelty. I made the experiment upon my fineſt wheat; becauſe my new workman had told me, that the ſtronger the corn was, the better and more regularly the mowing would be performed. My neighbouring huſbandmen, and all the reapers employed by them, thought me out of my ſenſes, and ſome of them even came to reaſon the matter with me. They meant well, and I took it kindly; but deſired them carefully to notice the event.

" My experiment was made upon three pieces of wheat, of ten acres each, ſituated in much more extenſive fields of the ſame corn; ſo that there was the faireſt room to make a juſt compariſon between the operation of the ſcythe and that of the ſickle.

" Some of the neighbouring huſbandmen had the curioſity to ſee the work performed, and were ſurpriſed to find that leſs corn was ſhed in this way, than in the common practice of reaping with the ſickle. They thought the method good; but made a few objections to ſome particular circumſtances, in which the experience of ſubſequent years ſhewed them that they were wrong. Their entire approbation then followed; and their mowers, finding that they ſhould be able by this means to cut down all their corn without the aſſiſtance of ſtrolling ſtrangers who often do their work very badly, gladly learnt the new method, and commended it to others.

" This trial ſucceeded ſo well, that I reſolved to cut all my crops in the ſame manner; and that nothing might be wanting to perfect my mowers in this practice, I procured a ſufficient number of expert workmen, maſters of the art, from the village of Trie, near Valenciennes, to aſſiſt and inſtruct them for the harveſt of 1753.

" This work required a precaution which has been duly attended to ever ſince: it is, to pick all the ſtones from off the land, every year, as carefully as poſſible. The expence of ſo ding is a very trifle, when compared to the advantages attending it. All the roads around my land, which were formerly impaſſable in winter, are now firm and good, fit for any carriage. We no longer hear of horſes lamed, or waggons overturned by them; and, which is equally true, I find that my ground now requires a leſs quantity of ſeed.

" I have now practiſed this method, in an extenſive manner, during five ſucceſſive years, in the courſe of which I have had opportunities of experiencing every circumſtance neceſſary to be conſidered in order to determine its real merit; I mean, mowing in rainy weather, and cutting of corn either bent, laid flat, totally lodged, or lodged only in particular places, and in various directions. I ſhall firſt deſcribe the mechaniſm of this mowing, and then point out its advantages, with the objections of my neighbours, which will ſhew the only inconveniencies I have met with.

" The Flemiſh mowers whom I employed in the year 1753, brought with them ſcythes exactly like ours. I ſaw no ſort of difference in their ſize, make, manner of being mounted, or even in the hooks they were trimmed with; ſo that I found I had been miſinformed by thoſe who told me in 1751, that this work required an inſtrument different from that which is uſed for mowing oats. It was not till the year 1755, that an ingenious workman pointed out ſome very proper alterations, which have ſince been made.

" This intelligent mower obſerved, that the common ſcythe cannot ſuit any ground but ſuch as has been plowed flat; that it therefore was leaſt of all proper for our lands, which are plowed in ridges of ten or twelve furrows, raiſed very high in the middle; and that its hooks broke the ſtraw, plucked off numbers of ears, and did not lay hold of many ſhort plants which grow in the bottom of the furrows, whereby a loſs was occaſioned, or take up the intermixed graſs and weeds ſo exactly as might be wiſhed. To remedy this, he took a ſcythe at leaſt ſix inches ſhorter than thoſe which are commonly uſed, and, inſtead of the hooks, ſubſtituted what he calls the bender, conſiſting of two ſhoots of willow, or other green wood, placed ſemicircularly upon the handle of the ſcythe, where the hooks are commonly ſet. To this end, there muſt be four holes in the handle, ſo that the end of one twig may be put into the lowermoſt hole, and its other end into the third, and the two ends of the other twig into the ſecond and fourth holes. The ſcythe thus trimmed is to be uſed in the manner I ſhall now explain.

" When a mower ſets about cutting down a crop of oats, he places himſelf ſo that the corn is at his right-hand, from whence the action of the ſcythe throws the waving towards his left. The mower of wheat, on the contrary, proceeds from outſide to inſide, ſo that the corn which he is next to cut is always at his left hand; and that which he has juſt cut, being collected by the bender, is reſted, inclining a little, againſt the adjoining uncut part.

" A helper, which may be a boy of twelve or fifteen years of age, or an elderly woman, follows the mower at the diſtance of four or five feet, with a reaping hook, or a ſtick about a foot and a half or two feet long, and, by putting that through the interval between the ſloping late cut wheat, and the ſtanding corn againſt which it reſts, takes up the former, gives the ſtraw ends a gentle ſtroke or two upon the ground, to form that parcel into a grip, and lays it down at his right hand. This ſhould be done very expeditiouſly, becauſe the picker-up, as this perſon is called, is followed by another mower; and it ſhould alſo be done dexterouſly, becauſe the greater or leſs quantity of gleanings depends thereon. There ſhould be as many pickers-up (we call them binders), as there are mowers.

" The

"The posture of the mower is a circumstance of such importance, that I think myself happy in having taken particular notice of it in 1754. In cutting grass and oats, the mower goes in such manner that his feet, which are moved alternately at each stroke of the scythe, describe two parallel lines. But in the mowing of wheat, the mower's track should be upon a single line, so that his right foot, which should be foremost, be driven forward by the left, at each cut of the scythe; not unlike the attitude of a fencer when he advances.

"An accident, which had like to have over-set my whole operation in the year 1754, demonstrated to me the necessity of this different posture. I employed for mowing my wheat, men who used to come yearly to cut down my oats: they were seven in number. On the third day of their labour, five of them fell ill; upon which I set three others to work: but the consequence was, that I had ten sick people to take care of at the end of the week. I visited them, inquired into their ailments, and found, that some of them had a fever, but that all complained of violent pains and soreness under their left ribs. At first, I inclined to think them pleuritic; but, upon a closer examination, and upon considering the nature of the work they had been at, I saw that their illness proceeded from badly managed hard labour, the stress of which had been made to lie chiefly upon the left side. I therefore ordered them to take their rest.

"The next day, upon visiting my infirmary, I found that two of the mowers were returned to their work. I went out to them, and saw, even at some distance, that their posture in this work was the same as if they had been mowing of oats. This immediately shewed me the cause of their pains. The scythes which they then used had the common sort of hooks, and were much heavier than those with only wicker benders. I took up one of them, put myself in the posture of a mower of oats, and shewed them, that as a much greater weight rested upon the hooks of the scythe when they mowed wheat, then when they cut oats; it was not possible for them, in the posture they had chosen, to move that increased load to the left, without an irksome twisting of the body. Then, putting myself in the posture of a fencer, as I had seen my Flemish mowers do the year before, I demonstrated to them, that the body was thereby placed in such an attitude as enabled it to exert the greatest strength, when, by the motion from right to left, it had the greatest load to support, and that, by the same means, this load was carried round without fatiguing the ribs of either side. My man took back his scythe, tried as I had directed, was convinced of the truth of my demonstration, taught his companions the same method, and they have done their business easily ever since. I thought it necessary to relate the circumstances of this accident, because I am satisfied that even the strongest men would sink under the labour of mowing wheat, if they were to stand in the same posture as the mowers of oats.

"Such is the manner in which this operation should be performed, when the corn stands upright, that is to say, in the most favourable years. I ought to add, that the mower should take care to place himself, for his work, in such manner that his left hand may be toward the wind. The corn is then naturally inclined over the scythe, and is the more easily cut closer to the ground. The resistance of the wind, be it ever so little, helps to keep the corn which is cut steady upon the benders of the scythe, and facilitates the motion which rests it against the uncut corn, where the binder takes it.

"The mower is not hindered from mowing close, by the wind's blowing at his back; but the corn which he cuts will not be so exactly collected by the bender: some of the ears will be a little scattered: but the greatest inconvenience is, that it does not rest so well against the standing corn, but is often blown down; which renders the binder's work slower, and more troublesome, and occasions greater gleanings.

"The wind is in a bad corner for the mower when it blows in his face. It then occasions a loss of stubble, and a great dispersion of the ears.

"But the worst of all winds for this work, is that which blows upon the right hand of the mower. The stubble then remains long, and so great a quantity of ears lies scattered about, that one would hardly think the ground had been harvested. My mowers did not place themselves in this manner of their own accord; but I made them do it for a quarter of an hour, to try the effect, of which I am fully convinced.

"When the corn is inclined, or bent, the mower takes it in the direction of its bending, from left to right; which has the same effect, in calm weather, as if the wind blew towards his left.

"Corn which is lodged cannot easily be mowed inward, because the binder would be incessantly impeded by the intangling of his grip with the un-cut corn. A good mower judges by his eye, which part it is most proper to begin at, and takes advantage of the wind when it can be of service to him. The method which I have seen most commonly practised, has been by taking the corn in the direction of its bending, and throwing it in waves. The work thus done is neatly performed: no remains of stubble are seen after the mowing; but the field looks like a meadow.

Corn laid absolutely flat, and intangled, is the most difficult to cut well. I have seen a mower take it in every various direction in which it was beaten down, as if the wind had been constantly at his back, and by this means he has cut as close as if it had been only lodged. My wheat was in this condition in the year 1757, and was mowed very regularly: only the work was somewhat longer about, than it generally is in other cases.

"I shall not speak of rainy seasons till I come to the objections against this method of cutting corn; because they have nothing to do with our mowing, and the only thing requisite in such cases is to keep the corn from sprouting in the ear: but I shall here relate the advantages which I find in this practice.

"The preservation of my fellow creatures is so dear to me, that I look upon the means of lessening their excessive hard labour at a time when the heat alone is enough to over-power them, as the first and greatest advantage resulting from this method. Now I see that a good reaper, with his sickle, can scarcely cut an acre of wheat in a day, let him toil ever so much; whilst the mower will dispatch from an acre and a half to upwards of two acres, according to his skill and dexterity. I have, indeed, met with but few able to exceed two acres, when they have done their business well: but we may reckon that a good mower, taking them one with another, and the corn as it runs, upright, lodged, intangled, &c. will clear an acre and a half, or perhaps an acre and three quarters, in a day, neatly, and without wasting any of it. This mower does then three fifths more work than a reaper can. It is true, he has not the grips to tie up, because the person who follows him does that part: but he is obliged to whet his scythe when he comes to the end of the field, and still oftener when the corn does not grow thick; besides which, notwithstanding all the care that can be taken to clear the ground of stones, not a day will pass without his meeting some, which will oblige him to have his scythe new hammered; and lastly, when he has finished a row, he must go back to the other end of the field before he can begin another. All this takes up at least as much time as the reaper's binding up what he has cut: and in regard to the hardness of the labour on each side, I believe that every one who rightly considers the nature of their respective works, and their postures in working, will allow, that the mower's toil and fatigue is three fifths less than that of the reaper.

"Another circumstance, well worth attending to, in this method, is, that the mower is not exposed to those injuries from thistles, thorns, and other noxious plants, which often prove fatal to the reaper.

"From the first of these advantages result several benefits: 1, a greater riddance of the necessary work. Not a year passes without the husbandman's experiencing that some part or other of his corn ripens too suddenly; and this unexpected maturity, being exceedingly heightened by the least delay, occasions a great waste, by the shedding of the grain, both when the crop is reaped with the sickle, and in loading and un-loading it when carried home: whereas the scythe, by clearing in two days a field which could not be reaped in less than five, in the common way, guards against that excessive ripeness.

" 2. This method of cutting down the corn requires fewer workmen.—I muſt here explain myſelf; becauſe the fact would contradict me, if it be objected that a mower and a binder are neceſſary in this way, for what the reaper alone does in the other. But I conſider, that to harveſt ninety acres, for example, of wheat, I muſt employ ten men at leaſt twenty days, with the ſickle; whilſt ſeven mowers, and their binders, (fourteen people), eaſily do my buſineſs in ten days. The difference then is equal to ſixty days work of one man: and if I do not intend to get my harveſt in quicker with the ſcythe than with the ſickle, I take but four mowers and four binders, eight perſons, of which the four laſt ſtand me in leſs expence than three reapers; becauſe I employ for this buſineſs young people, who would not be ſtrong enough to reap with the ſickle. Conſequently I have two workmen the leſs, and ſome advantage in the compariſon between the grown-up man, who has a higher price, and the lad, who anſwers my purpoſe.

" 3. The thus employing of children, old women, and men whoſe conſtitution is not robuſt, would be an advantage to the inhabitants of the place. It would afford the means of ſubſiſtance to a greater number of people, and prevent idleneſs and beggary; an important object upon many accounts. Almoſt every pariſh would find within itſelf hands enough to get in it's harveſt, without being obliged to have recourſe to accidental paſſengers, who often work badly, require exorbitant wages, and ſometimes leave their maſter in the middle of the harveſt, if they do not ſubmit to their unconſcionable demands.

" Let us leave ſpeculation, and notice ſome advantages which are evident beyond contradiction. 1, It is not a ſmall one to have a greater quantity of ſtraw, and that ſtraw intermixed with more graſs and other fodder, than when the corn is reaped in the uſual way. This does not need any proof; for every one knows, that the ſcythe cuts as cloſe to the ground as the mower pleaſes. Experience has ſhewn me, that the ſtubble has not been left two inches long upon our mowed fields, where the ſtones had been carefully picked off; whilſt the ſickle generally leaves it eight or nine inches long, and ſometimes much more when the ground is infeſted with thiſtles and other ſtubborn growths, which make the reaper lift up his hand to avoid them. The ſtraw is therefore plainly ſix inches longer when cut with the ſcythe, than with the ſickle; a difference which may be valued at a ſixth part more than that which is uſually reaped in the common way.

" 2. The green fodder in the mowed fields ſhoots up anew when cut, and affords excellent paſture after the corn is taken off. The ſame demonſtrative evidence as before, will again take place here with thoſe who but conſider, that the reaper, leaving the ſtubble either eight or nine inches long, takes off only the very tips of the graſs which chances to be within his grip; ſo that, being then near its time of maturity, it ripens its ſeeds, ſows them, and withers away: whereas, when the ſcythe cuts it within two inches of the ground, in its greeneſt and moſt un-ripe part, the yet remaining eyes, and the crowns of the roots, ſend forth new ſhoots, which form a good after-crop for cattle.

" 3. The paſture upon fields mowed with the ſcythe, is attended with an advantage, in regard to cows, which may perhaps be peculiar to my country. I know not whether it be the ſame elſewhere. We find every year, and I have always taken particular notice of it, that our cows ceaſe to yield milk during the firſt week of their feeding among the wheat ſtubble. I take the reaſon of this to be, that the ſtubble gets into their noſtrils, pricks them, hinders them from feeding, and makes them range the whole field over in queſt of graſs unattended with this irkſome inconvenience; ſo that they ſpend their time in running about, without grazing. I do not find that this accident happens to cows which are turned in among the ſhort ſtubble left by the ſcythe: the graſs there ſoon ſhoots up a-new, and yields me plenty of paſture, eſpecially if a little rain happens to fall after harveſt.

" It reſults from hence, that the huſbandman is enabled to feed more cattle than he could otherwiſe do, to ſave his ſainfoin or lucerne, and to have a greater quantity of dung; as I have experienced with almoſt incredible ſucceſs.

" I now proceed to the objections, which I ſhall ſtate in the ſame order as they were made; that is to ſay, as each year gave room for one or other of them.

" The firſt was, that the ſcythe muſt make the corn ſhed very much by ſhaking it conſiderably. To affirm the contrary may ſeem paradoxical; though the aſſertion will be proved from manifeſt principles, and by facts. To judge rightly of my propoſition, it will be neceſſary to compare the operation of the ſcythe with that of the ſickle; both of which I have examined very attentively.

" The reaper preſents his hand to the corn, and with wide extended fingers, graſps as much as he poſſibly can; after which, to bring the lower part of the ſtalks ſo cloſe together that the ſickle may encompaſs the whole of his grip, and at the ſame time to give it a tenſion which renders the action of the ſickle more certain, he gives it a violent ſhake, and at that inſtant cuts it. The grip thus cut is generally intangled with the ſtanding corn; or the reaper, when going to lay it down, finds that he has miſſed cutting a ſtalk, or perhaps more, which he then breaks with a jerk of his hand. Thus ſeveral ſhakes precede that which the corn receives afterward when it is tied up.

" The ſcythe has not theſe effects. I have already explained the mechaniſm of its operation, and ſhewn that the corn, cut without any violent ſhake, is carried gently by the bender (or cradle, as we more commonly call it) upon the ſcythe, to the ſtanding corn, againſt which it reſts inclined, till the binder takes it away to tie it up.

" To prove my propoſition by facts, I inſtance the following. After my wheat was mowed in the year 1752, in the manner before related, upon the three ſeveral ſpots of ten acres each, which were parts of much larger fields, I went, with four other perſons, purpoſely to examine with all the care we could, what quantity of grain might have been ſhed by the mowing. We found none at all in the two firſt mowed pieces; but a great deal in the other parts of the ſame fields which had been reaped with the ſickle. In the laſt piece, which was not cut till the corn was riper, we found a little grain in the mowed part, but incomparably more in the other. I did not repeat this ſearch every year with the ſame care, becauſe I had not always the ſame conveniencies of making a compariſon: but I have ſeen enough to be certain that no grain is ſhed unleſs the corn be exceeding ripe, and that much leſs is then loſt by the ſcythe, than by the ſickle.

" The following more important objection was afterward made by a ſenſible huſbandman, who obſerved to me, that, in a rainy year, the corn cut after this manner muſt be more liable to grow in the ear, than that which is reaped in the common way, becauſe the heads of the grips not being ſupported here by a pretty high ſtubble, the wet cannot well drain off; and that the grain will imbibe a great deal of moiſture from the graſs underneath, when the ear is beaten down upon it by rain, which will render it very apt to ſprout as ſoon as the ſun ſhines upon it. I had been told how to guard againſt this accident, but did not try the method till the year 1756, when it anſwered perfectly well.

" This method conſiſts in laying the grips in a triangular form, ſo that the head of one reſts upon the foot of another. This operation is neither long nor fatiguing; nor does it require, in order to do it quick, any thing more than a little dexterity in cloſing the triangle, by making the foot of the third grip ſupport the ears of the firſt. The rains which fell during the harveſt of 1756, rendering the getting in of that year's crops extremely troubleſome, my neighbours had a great deal of ſprouted corn; but mine eſcaped by this method; and what little I had, proceeded from that which remained un-mowed when the rain became inceſſant.

" With regard to the ſheaves, when bound, my Flemiſh mowers informed me, in 1753, of their practice when they are overtaken by laſting rains. It is, to heap upon one another, ends to ends, as many ſheaves as they can poſſibly cover with one, which is then opened and laid over them. My people did not practiſe this method, which I believe the beſt; but they ſecured my corn by other means, which anſwer extremely well, and are generally known.

" From

" From the above objection my husbandman derived another, relative to the difficulty of drying the grass and weeds intermixed with the corn, in rainy years, and the danger of housing the sheaves when full of that trash, which may ferment, and be the occasion of the rotting of a whole pile of wheat, I cannot answer this objection otherwise than by my experience. The harvests of 1756 and 1757 were certainly not favoured by the weather: yet all the wild growths which were cut down with, and bound up among my sheaves, were well withered when they were housed. No sort of smell which indicated the least fermentation was perceived in any of my barns; the threshers did not find any thing that looked like it; and the straw which is taken from those barns, to feed my horses, attests that there was not any.

" I now come to the last objection; by so much the more serious, as it is one of those inconveniencies which I cannot remedy, but to which I readily submit. The ears of the corn, say the objectors, do not lie so even in your grips, as in those which are reaped with the sickle; some of them are in the middle, and others at the very bottom of the sheaf; so that your corn is not threshed so well or so regularly, and you thereby lose perhaps a considerable part of it. 2, All the grass and weeds contained in your sheaves are threshed with the wheat, and their seeds are mingled with the corn when the thresher measures it out: consequently you pay him for threshing this trash, which again increases the labour and pay of the winnower.

" All this is true: but let us discuss the matter a little more thoroughly. There are ears in the middle and at the bottom of my sheaves: but they seldom are of any other kind than those which we call backward or late ears; the weak productions of sickly plants, or of seeds not perfectly sound. Repeated examinations have convinced me, that very few others are in this case; and these ears hardly part with their grain at any time, in whatever manner they are threshed; for though the grains be torn from off them by the action of the flail, the inmost husk still adheres to the corn. These diminutive imperfect grains are so great a detriment to the fine plump, well nourished corn, that they lessen its value if not carefully separated by winnowing; after which they serve to feed poultry. If these ears escape the flail, the straw is so much the better. Our horses and other cattle reap therefrom a benefit which we ought not to grudge, because, I think, it turns to our advantage.

" The threshed grass and other wild productions, do indeed yield a considerable quantity of what are commonly called bad or useless seeds, for the beating out of which I pay the thresher. But the grass which occasions this expence, saves me that of a great deal of sainfoin and lucerne which my cattle would consume: and it would be unjust in me to complain of the additional charge in the winnowing, since my manager has thought of applying those seeds to domestic purposes, such as feeding fowls, &c. which prove more profitable to me than an equal quantity of the finest corn.

" A real increase of expence, is what I pay the thresher beyond the common price of the country. This difference, which consists in two-pence or three-pence for a quarter of wheat, is but a just compensation for his extraordinary trouble in unbinding and binding up again perhaps an hundred and fifty sheaves, and sometimes more, for what an hundred sheaves generally yield, when reaped in the common way. But this expence is so amply repaid by the extraordinary quantity of straw obtained by my method, that I rate the difference at more than the value of five quarters of corn, which, to silence contradiction, I will suppose to be otherwise lost in my practice. Still my crop is cut down and housed with far less toil and expence, than if it was reaped."

" They begin plowing in the isle of Thanet, says a correspondent of the editors of the Museum Rusticum, about the first week in November, contriving so that the wheat season may be over by the end of the month.

" In the spring, if the wheat is rank and the weather dry, they feed it down with their sheep, which they think makes the wheat branch more, and settles the earth about the roots of the plants. Experience has convinced them, that this method of sowing wheat after trefoil, is better than sowing it on a fallow; for the land hereabout is naturally very light and hover, and the wheat on that account very much subject to be root-fallen. To prevent this, it is no uncommon thing for them, as soon as they have sown their wheat, to drive a flock of sheep over the land, to settle the earth close to the seed.

" Their crops of wheat here are generally three, four, and five quarters on an acre; which last is, indeed, a very large crop, when it is considered, that the land is in general, by nature, poor and barren, and that it is almost entirely owing to the industry and good husbandry of the farmers that it is at all brought to bear wheat: in fact, they are an assiduous people, and spare neither cost nor labour to improve their land.

" On the light land here they for the most part sow about fourteen pecks on an acre, but on the richer lands they allow four bushels.

" The farmers here never sow the seed produced by their own land; they find their wheat succeed much better by change; for which reason the seed which they sow on the light hover-land they chuse to procure from a gravel or deep cledge, or clay land, taking care that the soil on which the seed has grown should be as different as possible from that on which it is to be sown.

" Instead of making artificial steeps with great parade, they make use of that which Providence has put in their way, wetting their seed with salt water, which they fetch from the sea; and they afterwards sprinkle it with lime, to prevent the smut: they are also particularly careful to clear their seed from wild oats, cockle, &c.

" I know no part of England where there are better farmers; for though they keep their lands constantly cropped without fallow, which they call sowing a round tilth, yet do they so manage matters, as to keep them still in good heart.

" They reap their wheat very high here, leaving as much straw as possible in the field: this they say they do to save barn-room. Some farmers here have a practice of sowing rye to make bands for their sheaves, the straw being longer, and as they think tougher, than that of wheat. The reaper makes the bands, which he cuts as low as he well can, and binds the sheaves.

" The wheat stubble, which, as I said before, is left very long, is generally mown for the maltsters, as they burn it in their kiln to dry their pale malts for the London market. The greatest part of this island is a light chalky soil, so that wet summers in general agree best with it; and it is by this means the farmers here get so much money: for when the crops fail in other parts of the kingdom, they are almost sure here to be very large; and they have the great convenience, besides, of water carriage to the London markets. It is extremely pleasant, towards the latter end of the summer, before harvest, to ride over this little island: I do not imagine there is a more improved spot in the kingdom; the fields are all kept so clear from weeds, that they resemble a well kept garden; they grudge no expence in hoeing, weeding, plowing, or manuring; and experience has long ago convinced them, that they pursue a right method. Their practices are many of them good and worthy imitation; it would therefore be great pity if they were not made known, by some means or other, to the rest of the kingdom." *Museum Rusticum, vol. I. pag.* 3.

" It is now upwards of seven years that I have been tenant of a considerable farm in Essex; but as there are some particular circumstances attending this farm, I must beg leave to say a few words on the subject.

" The soil, which is, for the most part, a fine mellow loam, or what is in general called a good wheat soil, was in very good heart, and not impoverished; yet the last tenant broke on this farm, and the landlord lost by him near two years rent; for his crops of wheat were continually damaged by smut, let him take what care he would of the seed, and were besides often laid, and the land got very foul, though he was not sparing of his fallows.

" On the contrary, since I have occupied this land, it has borne large crops of good sound wheat, with very little smutty corn, and barley, oats, peas, beans, and other things in proportion. What will appear still more furprifing is, that I do not lay on half fo much dung as he did.

" It will now, perhaps, be neceffary to explain this feeming paradox. At no great diftance from the farm lives the landlord, who is a man of fortune, and drives a fet of horfes. This gentleman keeps no land in his own hands, fo that he was for many years obliged to buy all the ftraw ufed for the litter of his ftables, which amounted to a very confiderable quantity: however, when the laft tenant of this farm came into it, having been a fervant in the family, he offered to fupply the efquire with ftraw for his ftables, provided he might have all the dung, except what the gardener had occafion for. The 'fquire thought this a good propofal, and the farmer imagined he had the beft of the bargain; fo the matter was foon fettled.

" Now, you are to underftand, that the 'fquire kept, befides feven coach-horfes, a ftable of hunters, a number of road-horfes, and a pack of hounds; fo that there was made on his premifes, in a year, an incredible quantity of rich dung.

" The farmer imagined he was now in a fair way of making his fortune; for his father had taught him, that the man who can command dung is always fure of large crops: but this did not prove true in the prefent cafe.

" To proceed; my predeceffor went on ploughing his land, got his fallows in good order, dreffed them largely with dung, and always fowed them with wheat.

" His crops of this noble grain, however, by no means anfwered his expectations: his wheat conftantly looked well and promifing in the winter and the early part of the fpring of the year; but as it advanced, it grew rank, and at harveft was either run all to ftraw, and was befides very fmutty, or elfe, if a heavy fhower of rain happened to fall, it was lodged, matted, and grew. This was indeed a very mortifying circumftance, but our farmer could find no remedy for it. He feveral times, without fuccefs, tried folding fome fheep on his wheat; but this part of hufbandry, for want of fkill, he managed fo badly, that he loft two entire crops, for he had fcarcely the return of his feed at harveft. This could never hold long; fo that in the end he was, as I faid before, broke and ruined.

" This man never could be perfuaded that any part of his lofs was to be attributed to the dung he laid on his land, though he conftantly manured it with the horfe-dung before it was half rotten, and without any mixture to allay its great heat: this kept the foil in a conftant ftate of fermentation, and ftocked it with weeds, infomuch that, when I took poffeffion of the farm, fome of the foil was abfolutely mouldy, and ftunk again, it was fo rank.

" I will now inform you of my method of management, that you may be enabled to judge how far I was benefited by the errors of my predeceffor.

" I found fixty acres of fallow ready for fowing with wheat: thefe, as the land was rank, I fowed with the winter tare, which I knew, by experience, would choak the weeds, and abate the ranknefs of the foil. In fome parts, where the foil was not fo rank, I ploughed in the tares in order to fow wheat over them; in other parts I fuffered the tares to ftand for a crop, which, however, was not confiderable, they ran fo much to ftraw or haulm.

" When the tares were off, I got the land inftantly in order, and fowed the whole with wheat, of which I had a better and cleaner crop than had been known upon the land for upwards of feven years before: this all my neighbours acknowledged: however, it was neither clean enough, nor confiderable enough, to fatisfy me. Some of your readers may, perhaps, wonder what I did with my tares, as but few are fold at the country markets; but I muft inform them, that I live within ten miles of a fea-port town, whither I fent them at various times, in order to their being carried by fea to London.

" I am to obferve to you, that I continued the agreement of giving the 'fquire ftraw for his dung; but I made a ufe of it very different from my predeceffor.

" I make it a rule never to manure for wheat, or fow wheat on a fallow. I do not indeed allow many fallows on my land; and when I do, I generally fow my fallow with barley, to which I allow four or five ploughings. This commonly yields me a large return, and I have a good crop of wheat after it.

" This, however, is not my general method; for I am very fond of the hoeing hufbandry, to practife which, in fome degree, is the only infallible way of keeping land clean. To begin then with my method, I never lay dung alone on my land, let it be ever fo rotten; but as foon as I get any long dung from the 'fquire's, I carry it to my compoft-heap, where it is mixed in alternate layers or beds, with frefh virgin earth, (if I can get it) lime, or chalk, lime rubbifh, fcourings of ditches and ponds, turf, leaves of trees, and all the dung and offal of my family, of the hog-yard, the poultry-yard, and the dog-kennel. As to my pigeons-dung, I always preferve it to mix with foot, and ufe the mixture as a top-dreffing for my wheat, whenever it happens to be too backward in the fpring.

" But to return to my compoft: I have always feveral diftinct heaps of different ages, and I fometimes leave it three years before I ufe it, and never lay on any under two years old.

" When I have got a plot of ground in order, I give it a thorough good dreffing of this compoft, which I immediately plough in. I then fow it with fome crop that requires hoeing, fuch as horfe-beans, broad-beans, or white or grey peas. During the whole fummer, I take care to keep thefe crops very clean by hoeing, efpecially if the feafon is rainy; and I am particularly cautious in preventing any of the weeds from perfecting their feeds.

" When my hoeing-crop, which generally more than pays me all my expences, is off the land, I immediately get it into as fine tilth as I poffibly can, by repeated ploughings, and then fow it with either wheat or barley, whichever is likely to pay me beft; for little as fome of your readers may think of it, barley, when it is fown on good land well prepared, is very frequently as profitable a crop as wheat.

" By thus fowing my wheat after a hoeing-crop with dung, I have always a good return of clean corn, often five quarters on an acre; and my land will ftill be in heart enough to give me a reafonable crop of oats; after which, without any fallow, comes my hoeing-crop, &c.

" When I fow barley after the hoeing-crop, I fuffer wheat to follow it; and then it is that, if I find it neceffary, I give the wheat in the fpring a top-dreffing of foot mixed with pigeons-dung.

" I fometimes allow only fix pecks of wheat-feed to an acre: this is when I fow over it, in the fpring of the year, eighteen pounds of broad clover-feed, which I harrow in with a pair of very light harrows; and it does not in the leaft damage my wheat-plants. I leave the clover only two years on the land; for the fecond year, after I have mown the firft crop for hay, I fuffer the fecond to grow very rank, (having given my land a flight dreffing from my compoft dung-hill the preceding year) which I plough in, and over it fow wheat, to be harrowed in on once ploughing.

" Thefe crops of wheat are fmaller in quantity than any others I get, but the grain is finer, plumper, brighter, and heavier, generally felling for more at market, as being always very clean and clear from feeds of weeds.

" In my method of farming, fome particulars are to be noted. In the firft place, as my crops fucceed one the other very quick, I am under a neceffity of having all my ftubble extirpated before I give the land the firft ploughing after the crop is off. If it is a wheat or bean-ftubble, I generally have it all pulled up by hand by women and children; barley and oat ftubbles I have torn up by a pair of loaded drags, and afterwards gathered into heaps and carted to the compoft-heap. This I do to prevent the ftubble from being buried by the plough, and from growing mouldy in the land; from which mouldinefs I have great reafon to think fmut often proceeds.

" Another thing to be noted is, that I allow lefs feed to my land than moft of my neighbours, my quantity being from feven to nine pecks of wheat, from nine to twelve of barley, and about twelve of oats to an acre of land; but it is always to be prefumed that the feed I fow is good. If any farmer fhould imagine that thefe quantities are too fmall, let him fuppofe every wheat-plant to occupy a fpace of fix inches fquare, which is fmall enough: let him then calculate how many fuch fpaces there are in a fquare acre. When he has done this, let him proceed to count how many grains of wheat there are in a pint, which multiply by the number of pints in nine pecks, and he will find by the refult that I, in fact, allow too much feed." *Mufeum Rufticum, vol.* V. *p.* 104.

"I have, for fome years laft paft, held a confiderable farm in the county of Leicefter, and have, thank God, met with fome fuccefs in my practice.

"My methods of farming are thought by many to have fomething peculiar in them; yet, as I do not often mifcarry, no one has a right to find fault with me.

"Great part of my farm is very good wheat land, the foil being a fubftantial loam.

"I frequently, as well as the reft of my neighbours, make ufe of lime as a manure; but then I ufe it differently from what they do.

"The common practice is, to lay about forty bufhels of unflaked lime on an acre, which makes a peck on every fquare perch, (half a bufhel when it is flaked.) On wheat land they fpread the lime at the fame time they fow the feed; but this is a way I do not much approve, and for this reafon I vary my practice. The method I ufe is as follows: I fow my wheat without laying on any manure; but in the beginning of the month of February I get, for every acre of land I intend to lime, twenty bufhels of that manure, unflaked, and forty bufhels of fand, or the rubbifh of a brick-kiln.

"Towards the latter end of the month I caufe the lime to be flaked, which doubles its meafure, and very well mixed with the fand; immediately after which, in the laft week of the month, I have it fcattered by way of top-dreffing over the green wheat; and as rain generally fucceeds, it is foon wafhed down to the roots of the plants, and gives them a vigour and ftrength of growth, that is really aftonifhing to a perfon who had never feen this method practifed.

"This is my way, if I fee the weather is inclinable to be wet; but if it is dry, and not likely to rain, I double the quantity of fand, in order to take away all danger of the wheat-plants being burnt, or hurt, by the ftrongly-corrofive power of the lime.

"The above method I would willingly recommend to the attention of your readers; and though I have benefited greatly by it, yet need they not take my word, as it is fo very eafy to make a fmall trial, and form a judgment from the fuccefs they may have.

"I muft obferve, that I look upon it to be almoft a matter of indifference what kind of fand I ufe, except that I prefer lime-ftone fand to the cryftal fand, as being moft abforbent, and in truth prefer the rubbifh of broken bricks to either.

"It will perhaps be unneceffary to tell your readers my motive for this preference; yet that I may not be thought obfcure, I fhall do it.

"When lime is flaked, it crumbles and falls into very minute particles: the fmalleft of thefe particles are, together with the moifture that adheres to them, abforbed by the large open pores of the brick rubbifh, which afterwards difpenfes them by flow degrees to the foil on which it is laid, for the fupport of the crop: this occafions the operation of the lime to be more equal; the parts which were not abforbed, are firft attracted by the earth; thefe nourifh the young plants, which, in time growing ftronger, have power to draw from the abforbent the particles it had referved for their ufe." *Mufeum Rufticum, vol.* III. *p.* 366.

"Almoft every part of this kingdom has a method of farming peculiar to itfelf; and this I have often found to be true, in the many journeys I have made through various parts of the ifland.

"A fhort time fince, my occafions calling me down into the Weft, I ftopped for a few days in Wiltfhire, where I could not help obferving, that the wheat-corn was remarkably backward, though it, in general, promifed to be a good crop.

"I thought it worth my while to afk fome of the neighbouring farmers the reafon of this appearance, when I was informed that moft of the wheat was fown late, owing to a wet autumn, which prevented them from giving their land the neceffary ploughing for that crop fooner than November, December, and even January.

"The foil is a pretty good loam, on a chalky bottom: and I found they often fow late; but whenever they do it, they take care to allow an additional quantity of feed, generally one fourth, or a third, more than they ufe when they fow early.

"I was alfo told, that many benefits often refulted from fuch late fowing; particularly, the crop is generally clearer from weeds; for in early-fown wheat, poppies, and other noxious weeds, are very apt to get a-head, and greatly injure the corn. I even faw in my walks many early-fown fields, which rather feemed to be under poppies than wheat, as the poppies were in full bloom, and made a glaring appearance.

"The Wiltfhire farmers, the beft of them I mean, often give their land four ploughings for wheat; and they find their advantage, as it is by fuch means brought to a fine tilth, and yields a good crop.

"Another advantage they told me they had from fowing their wheat late was, that in the blooming feafon the weather was generally fine; whereas, in a wet fummer, the bloom is often wafhed off from the forward-fown wheat.

"But it muft not be imagined this method of fowing wheat late is indifcriminately purfued: in many circumftances it would be very imprudent to do it.

"This method of hufbandry muft, to meet with fuccefs, be chiefly practifed on fallows, where the land is good, and has been well dreffed.

"Every crop, and method, has dangers to encounter; and the chief danger of late fowing is, that a froft may come on juft as the feed begins to fprout; but then good land, well dreffed, is not fo fubject to this misfortune as poor, unmanured land, that has, perhaps, been not half ploughed.

"I find, from enquiry, alfo, that it is dangerous fowing wheat on clover lays on one ploughing only, unlefs it is done fooner than the middle of November; for the turf, or grafs lay, forms a cruft immediately under the feed corn; and this not only prevents its taking a firm rooting, but alfo expofes it to the ravages of field fowls, which are, at this feafon, particularly voracious, as having a fcarcity of food; and the infant plant is, befides, liable to be killed by the froft, juft as it is about fprouting and fhooting out its firft leaf. It ftands, therefore, to reafon, and is warranted by experience, that wheat fhould not be harrowed in on a clover lay, on one ploughing, fo late after the middle of November, as the danger is great, though the lofs may not always be certain." *Mufeum Rufticum, vol.* III. *pag.* 1.

"As I have been many years a farmer, it is not to be wondered at that I fhould know fomething of hufbandry.

"Experience, which is an excellent miftrefs, has, in fact, beftowed on me moft of the knowledge I have acquired: I imagine, therefore, that an account of the refult of this experience, will not be unacceptable to your readers.

"Moft farmers chufe to fow wheat on a fallow; we, in Effex, on the contrary, often, not without good reafon, avoid it. Every fallow defigned for wheat requires a good dreffing of rotten dung, or fome other manure; and this dreffing, we imagine, often is the caufe of a fmutty crop, if laid on uncompounded; therefore, whenever I fow my wheat on a fallow, inftead of laying on my muck-heap unmixed, I make it into a compoft in the preceding fpring: this compoft confifts, according to the nature of the foil it is to be laid on, either of chalk, light earth, and rotten dung, or of lime, clay, and dung, laid in a heap, in alternate layers, or beds.

"This compoft-heap I caufe to be frequently turned during the courfe of the fummer, till it is thoroughly mixed, and forms one united mafs of manure, rather crumbly than otherways.

"With this manure I drefs my fallows in the fame manner farmers lay on their rotten dung alone; and I find, by experience, it is lefs apt to heat and canker the wheat-feed, and it is alfo much lefs inclined to mould and burn the feed.

"This, I fay, is my method of management when I fow my fallows with wheat as a firft crop; but I more generally approve of making wheat the fecond crop after barley, oats, beans, or peas.

"I am fenfible many of your readers will be furprifed at this method, and exclaim that it is impoffible to get a good crop of wheat but after a good fallow; yet I know the

the contrary: it is from experience I know it; may I not therefore venture to aſſert it?

"When I intend to ſow wheat as a ſecond crop, I lay my due quantity of compoſt on the land ſome time before I ſow it with barley, oats, beans, or peas.

"When this crop is off, the following year I ſow wheat. You may ſuppoſe the land to be duly prepared by well-timed and careful ploughings; but I am to premiſe, that after beans and peas, being hoeing crops, the land is much ſooner brought into good tilth, than after oats or barley.

"The wheat ſowed the ſecond year of the fallow is, with me, generally a good crop, and almoſt always clear from ſmut and pepper-wheat.

"If, by any accident, the wheat ſhould be ſickly, or pining, after Chriſtmas, I beſtow on it a top-dreſſing of wood aſhes, ſoot, if I can get it, or coal aſhes, if the ſoil happens to be ſtrong: this ſeldom fails anſwering my expectations; checking the growth of the weeds, and forwarding that of the corn.

"It is very frequently that I ſow wheat in this manner for a ſecond crop; but when I have an opportunity of chuſing, which I cannot always do, as I muſt ſuit my crop to my wants, I prefer, for the firſt crop, beans or peas, either of which I take to do the land nearly as much good as a fallow.

"Neither peas, nor beans, are, in my opinion, great impoveriſhers; and the frequent hoeing which they both require, if they are properly cultivated during their growth, brings the land into finer order than the beſt regulated courſe of huſbandry with the common implements could effect.

"Wheat ſucceeds particularly well after either of theſe two laſt-mentioned crops; and I have found, by experience, that if peas, or beans, are made intermediate crops, and are well and properly hoed during their growth, land of a moderate quality may, without being impoveriſhed or hurt, be made to bear a continued ſucceſſion of crops for many years; but it muſt be underſtood that it ſhould, from time to time, be refreſhed with proper dreſſings of well-prepared compoſt.

"I know, many farmers think there is no ſuch thing as carrying on a courſe of huſbandry without allowing, once in three or four years, a year of fallow; but ſuch are little acquainted with the benefit reſulting from hoeing crops; and it is this benefit that has of late induced farmers to ſow ſuch immenſe quantities of turneps in the counties of Norfolk, Suffolk, Eſſex, and other counties adjacent.

"Many of the advocates for intermediate fallows think that the earth requires reſt; but this is a great miſtake; for I could eaſily make it appear that, in a proper method of huſbandry, land might be almoſt continually cropped, without being impoveriſhed or worn out.

"The real benefit accruing from frequent fallows is, that they allow the huſbandman time and opportunity to bring, by good tillage, his land into proper order for the reception of the ſeed; but in the method of huſbandry I would recommend, the land would always be kept, by frequent ſtirring, in ſuch good tilth, that the time betwixt gathering the crops, and ſowing the next ſucceeding ſeed, would be abundantly ſufficient for any preparation it might require; for it is a well-known fact among huſbandmen, that when land is well tilled and kept in good order, one ploughing will go much farther than three where the land has been neglected, is rough, and grown hard and cloddy, through inattention or lazineſs." *Muſeum Ruſticum, vol.* III. *p.* 3.

"A wet harveſt, ſays an old huſbandman, is what a farmer dreads more than almoſt any thing, as it hurts the quality of his corn, increaſes his expences, and greatly leſſens his profits.

"So much depends on the well getting-in of our bread-corn, that every man, who knows any thing that can forward ſo good a purpoſe, is, I think, in duty bound to communicate it for the benefit of the public.

"It is a well-known maxim that wheat ſhould be left for ſome days in the field, after it is cut, before it is inned: this, the farmers think, and not without reaſon, improves its quality; the dews plump the kernels, and the ſun brings it to a proper and perfect ſtate of maturity.

"Theſe then are the benefits that reſult from leaving the ſheaves for ſome time abroad; but it is neceſſary the weather ſhould be fine, or great loſſes are often the conſequence of this practice.

"Sometimes, when the farmer leaſt expects it, the weather ſets in foul, and it rains for ſeveral weeks ſucceſſively: it is then very difficult to preſerve the wheat from being greatly damaged, notwithſtanding the many contrivances that have been thought of for this purpoſe.

"Some ſhock their ſheaves, ſetting them up in traves of ſix ſheaves of a ſide, and two to cap them; but this is a very dangerous method, and never to be practiſed after much rain has fallen: if the ſheaves were dry when the traves were ſet up, from an expectation of its raining, it is of great ſervice; but if the ſheaves are firſt ſuffered to be wet, ten to one but the corn ſweats, ſprouts, and rots, by being ſo cloſe confined from the action of the air.

"After all, I am apt to think that it is full as well not to cap the ſhocks; for if the rain is not very heavy and conſtant indeed, the ears, provided they do not touch the ground, will dry nearly as faſt as they are wetted.

"In Middleſex, Kent, and ſome parts of Eſſex, they generally bind their wheat as they reap; but then it muſt be ſuppoſed that their crops are, for the moſt part, pretty clear from green weeds, which would otherwiſe cauſe the ſheaves to ſweat violently in the mow, and greatly damage the corn.

"When a farmer is ſo unfortunate as to have his wheat-ſheaves thoroughly wetted, if fine weather enſues, I would by all means adviſe him to unbind them, and afterwards ſpread them out to be dried by the ſun. This ſimple method will often prevent great loſſes, and the wheat may at laſt be got in in tolerable good order.

"If the rain, however, ſhould continue long, and there ſhould be danger of the kernels growing, which by obſervation he may eaſily judge of, I would adviſe the thinking farmer inſtantly to carry it home wet as it is, and afterwards manage it as I ſhall direct from my own frequent experience.

"When the waggon, or cart, comes home loaded with ſheaves, let them be thrown promiſcuouſly into the bay of the barn, and not regularly mowed; for it is neceſſary they ſhould lie hollow, that the air may get into the vacuities, and prevent the ſheaves from heating during the little time they are to continue in the ſituation above deſcribed.

"Let our farmer next prepare ſome cutting-boxes, ſuch as horſe-meat is cut in, in Kent, and ſome other counties. The number of theſe boxes ſhould be according to the quantity of wheat he has wet; but three or four conſtantly kept going will do a great deal of work.

"With theſe cutters let the ears be cut off from the wet ſheaves; and when a ſufficient quantity are collected from all the boxes, let them be put looſely up in ſacks, and carried to a malt-kiln, there to be regularly and gradually dried; and when the firſt parcel is done, another is to ſucceed, and ſo on till the whole work is completed.

"This method I can, from my own experience, recommend to your readers; and it is leſs expence than would at firſt thought be imagined. The heat of the kiln may be kept up higher than when malt is drying, as the chaff of the ear will prevent the kernel of the wheat from being damaged by the fire, unleſs the heat is very intenſe indeed; but it will, however, be proper to keep the ears gently ſtirring with a fork, or rake, during the time they are drying.

"In this management the farmer will find great advantages; and his wheat will, with a very inconſiderable additional expence, be nearly, and ſometimes quite, as good in a wet harveſt, as if it was houſed in ever ſo good order, in fine ſun-ſhining weather.

"If, by chance, after you have cut off the ears from the ſheaves, the weather ſhould change, and become fine, you may often dry them without the aſſiſtance of the kiln, by ſpreading them thin on a large threſhing-cloth, and turning them frequently with a wooden rake; and even, if by this method you ſhould not entirely dry them, it will ſtill bring them ſo forward that the kiln will eaſily complete the cure.

"I muſt, however, before I conclude, caution the farmer not to ſuffer the kiln to be much heated, unleſs the ears are kept conſtantly ſtirring during the time they are drying." *Muſeum Ruſticum, vol.* II. *p.* 106.

"Give me leave, ſays a practical farmer of Warwickſhire, to mention to you a practice which, however, I do

 not

not abſolutely recommend, though with me it ſucceeded, and, as I have been informed, has done ſo with ſeveral other farmers, who have ventured to make the experiment.

" A few years ago, after what I thought a good fallow, I ſowed a field, containing five acres, with wheat. The foil was a good loam, but rather light than ſtiff, and inclined to be ſtoney. The wheat plants looked healthy during the whole winter, and promiſed fair to yield me a plentiful crop; but in the ſpring, warm rains coming on brought ſuch ſtore of weeds, that my wheat was in danger of being choaked.

" I was for ſome time puzzled what to do; for it being now the latter end of May, and the wheat being on the ſpindle, and ſome even in the ear, to weed it with hooks would have been endleſs, not to mention the damage that would have been done to the plants by the weeders feet.

" I had at one time thoughts of mowing wheat and weeds all together, and drying them to make fodder for my cattle: intending, if I had done this, to have got the land as faſt as poſſible in order, and ſown it again with wheat the ſucceeding autumn.

" However, in looking over the field, I found no great deficiency of wheat plants; but they were in moſt places ſo over-topped by the weeds, as to be ſcarcely viſible, and in the furrows, in particular, not a blade of wheat was to be ſeen.

" My method of ploughing for wheat-feed in this land is, to make narrow ſtitches, but wider than a ridge, and more rounding, being not ſo ſharp on the back.

" Whilſt I was meditating what to do in this matter, a gap was by ſome accident made in the hedge, and a parcel of my ſheep got into the wheat field.

" As ſoon as I ſaw where they were, apprehending great damage, I ordered them to be immediately driven out, and the gap mended.

" On taking a ſurvey, I was not a little ſurpriſed to find that the ſheep, inſtead of doing any damage to the wheat, had done it a great deal of good, for they had eat up almoſt every weed which grew in that part of the field next to the paſture.

" Encouraged by this accidental diſcovery of a propenſity in ſheep to eat weeds rather than wheat, I turned a hundred of my flock, into the field, two or three hours in the morning and the evening, for ſeveral days together, till all the weeds were nearly conſumed.

" On inſpecting my field afterwards, I found the ſheep had done very inconſiderable damage to the wheat, but the weeds were eat down ſo cloſe that they could never again get a-head; the wheat going on proſperouſly, and yielding me at harveſt a plentiful crop of clean, good corn, which was more than any of my neighbours could that year boaſt of.

" Whilſt the ſheep were eating the weeds, I found they moſtly walked in the furrows, as being eaſier to their tread than the ſloping ſides of the narrow ſtitches; and this might be one reaſon of their doing the wheat ſo little damage by their treading.

" In this new method of huſbandry I took, however, one precaution, which, I am apt to think, greatly contributed to my ſucceſs.

" The precaution, I mean is, that I never let them lie in the fields at night, as the weight of their bodies when they lay down to ſleep could not have failed doing great damage to the plants." *Muſeum Ruſticum, vol.* III. *p.* 31.

" Permit me, ſays another experienced farmer, to communicate to your readers, for their benefit, I hope, a little of the experience I have in many years acquired.

" Being now grown old, and retired to ſpend the remainder of my days in this city, I trouble myſelf but little about the practical part of farming; yet did I ſome years ago occupy a conſiderable tract of ground in Norfolk.

" I ſhall, for this time, confine myſelf to the propriety and impropriety of feeding wheat down with ſheep in the ſpring; a practice which has by many been hitherto but little underſtood.

" This practice, when prudently adopted, is replete with many and great advantages; but if indiſcriminately adopted, nothing would ſooner ruin a farmer.

" The advantages to be derived from it are, that it affords feed for your weathers and ewes after the turneps are conſumed, and before the ſpring feed comes in; it cauſes the wheat to tiller and branch more than it would otherwiſe have done, and of courſe produce a larger and better crop; it brings, by the rich manure it affords the land, the crop forwarder, and makes it heavier in the ſcale, as well as plumper in the buſhel.

" The diſadvantages attending this practice are, that, in certain circumſtances, it checks the growth of the corn, and makes the ſecond ſhoot diminutive and ſmall; of courſe the ears are lean and poor, and the crop in proportion. It gives the weeds an opportunity of getting a-head, and ruining the crop, to the farmer's great loſs and diſappointment.

" I ſhall, to be better underſtood, relate ſome caſes which happened to myſelf, as I find them noted in my journal, for I always kept one.

" In the year 1742, I had ten acres of wheat, which, after Chriſtmas, ſeemed proud. The ſoil was a looſe loam, and I had, when I fallowed, laid on plenty of dung.

" I turned into this field a parcel of ſheep on the twenty-ſecond of January, in order to feed it down, which they did; but the weather coming in milder than I expected, the weeds, which had been brought in with the dung, got ſuch a head, that I was above twenty pounds loſer by feeding it.

" In 1744, I fed, very indiſcretely indeed, another piece of wheat of fifteen acres. The land was poor, and had not been well dreſſed, ſo that about the tenth of March the wheat-plants ſtood very thin. I turned in ſome ſheep, thinking it would afterwards branch more, and produce a better crop; but I was diſappointed, for the ſheep bit off the knot of the plant, and I had, I think, the worſt crop I ever reaped.

" The next year, 1745, I had another thin crop of wheat on much the ſame land as the laſt: I turned in ſome ſheep the ſixth of February, before the knot was above the ground within reach, and it ſucceeded; for, as I gave it a good top-dreſſing within a fortnight, it tillered and branched ſo well, as to produce a much better crop than I expected.

" I could relate to you many other circumſtances of this nature, but it would take up too much room; I ſhall therefore proceed to make ſome obſervations on my general experience in this manner.

" I find wheat ſhould never have any ſheep turned on it, unleſs it is forward in January, and likely to be lodged at harveſt, except now and then, with great precaution, when you want to thicken a crop.

" Such wheat only ſhould be fed down as was early ſown; and I hold it a bad practice if the land is rich with dung.

" Wheat ſhould not be fed down, unleſs the land is pretty clear of weeds, and has ſtrength and ſubſtance enough to afford the wheat nouriſhment in plenty, that it may get into ear at the proper ſeaſon, notwithſtanding the growth was ſo checked.

" There is in every plant of wheat a certain knot, or crown of the root as I call it, from which all the branches iſſue: now, if this crown is nipped off by the ſheep, a dwindled production is the certain conſequence; for this reaſon, ſheep ſhould never, (unleſs it is in a very backward ſeaſon, and then it will not be prudent to feed wheat down at all;) I ſay, ſheep ſhould never be turned on it after the middle of February: the beſt time, in general, is the latter end of January, or even the middle of that month.

" If ſeaſonable rains follow, provided the ground is clear of weeds, it will be greatly to the advantage of the farmer.

" If the farmer has the leaſt doubt of the ſtrength of his land towards giving the checked plant nouriſhment, I would by all means have him afford his wheat a top-dreſſing of ſoot, aſhes, malt-duſt, or whatever other proper manure he may have at hand, provided he is ſure it is quite clear of weeds.

" Let not the induſtrious farmer be at all uneaſy if, after feeding down his wheat, he perceives the plants ſtand at a diſtance one from the other; for if he has practiſed this piece of huſbandry, with the precautions above noted, he may depend upon it, that every plant will throw out a number of branches, and that he will have a field full of ſtalks at harveſt, and a crop that will ſurpriſe him.

" I am very fond of recommending wheat crops to the farmers attention, not only becaufe it is the moft noble of grains, but alfo becaufe, if well managed, it is the moft profitable.

" We muft not always judge of the farmer's profits by the produce of his land; which fome of your readers may think odd; but I will make it appear by an example from my own practice.

" In the year 1743, I had two fields, of twenty acres each, in wheat; one of which yielded me, at harveft, at the rate of four quarters an acre throughout; the other yielded me only twenty bufhels, one acre with another; yet I got more by the laft than the firft. The cafe was thus: falling fhort of dung, I was obliged to buy; but it was fo dear, that I only bought enough for the firft field, giving the other two ploughings extraordinary, inftead of manuring it; and thefe ploughings I reckon at a mere trifle, as my horfes would otherwife have ftood ftill." *Mufeum Rufticum, vol.* III. *pag.* 151.

" I have often thought that it would be of great fervice to the public, if, by any method, there could be determined a mean weight for any given quantity of corn, and likewife what number of grains, upon an average, ought to be contained in each ear, and the proportional weight between the ear, with the grains in it, and when taken out, and likewife the proportional difference between the weight of the whole ftalk, including the ear and the grain.

" But in order to fettle this medium, under our prefent confideration, it will be abfolutely neceffary, in the firft place, to make accurate and impartial experiments for a number of years, and then, by comparing the produce and the weight, &c. of the whole, both feparately and together, we may come pretty near the mark in view.

" In order therefore to purfue the plan I had laid down, in the beginning of the harveft of the year 1757, I got three ears of common red Lammas wheat out of —— field, Auguft 26. I then cut off the ftalk clofe to the ear, which I weighed with the corn in it: I then weighed the grains when rubbed out of the ear, and cleared from the chaff: in the next place I compared the difference, and then counted the number of grains in each ear refpectively; and at the end of every year fet down the weight of a cubical inch of the produce of that harveft.

" But in order to give a clearer idea of my method of proceeding, I will fet down the weight, &c. of the corn which was gathered from the firft field, in columns, in the manner I entered it in a book kept for that purpofe, which will be fufficient to explain the whole without a multiplicity of figures.

Number of ears, when and where got.		Weight of the ear with the corn in it.	Weight of the grain when free from the chaff.	Difference.	No. of grains in each ear.
1757.		ʒ ℈ gr.	ʒ ℈ gr.	ʒ ℈ gr.	
Three ears got	1	0 1 5	0 0 19 5	0 0 5 5	28
in —— field,	2	0 1 2	0 0 17 5	0 0 4 5	27
Auguft 26.	3	0 1 7	0 1 1	0 0 6	36
Total.		1 0 14	0 2 18	0 0 16	91

"I proceeded in the fame method with each of the three ears taken out of fourteen other different fields, during the time of the fame harveft: then cafting up the fum total of each column, and dividing their products by the number of ears gathered that feafon, the quotient would give me the mean weight, &c. of an ear of that harveft, and its number of grains, &c. &c.

" I then made a cubical veffel containing exactly a fquare inch; and having mixed all the corn together, I filled the above veffel, and weighed its contents with the greateft accuracy; which weight I fet down, repeating the operation feven or eight times, having well mixed the little heap of corn together, after each trial, and then fet down the weight of each as before: and as there would fometimes be the difference of a grain or two more or lefs in each cubical inch, I divided the product of the whole by the number of times the experiment was made, and fet down the quotient as the mean weight of a cubical inch of corn for that year, which in 1757 I found to be 3 dr. 12.3 gr. I have perfevered in this method every year fince: but to avoid troubling you with the particulars of each, I will give you at one view the mean weight, &c. the number of grains in an ear, and the weight of a cubical inch for each of thefe laft feven years paft, and after that the medium of all taken together.

" I made ufe of apothecaries weights upon account of the fmaller fubdivifions of the ounce into drachms, fcruples, and grains, which I have afterwards, in reckoning up the weight of the bufhel, reduced to troy, and averdupois. But we will now give the refult of the feven years experiments in the following columns.

A. D.	Mean weight of each ear with the corn in it.	Mean wt. of the grains alone.	Difference.	Mean No. of grains.	Mean weight of a cubical inch.
	ʒ ℈ gr.	ʒ ℈ gr.	ʒ ℈ gr.		ʒ ℈ gr.
1757	0 1 10 5	0 1 5	0 0 5 5	38	3 0 12 3
1758	0 1 5	0 1 0 5	0 0 4 5	30 4	3 0 13 3
1759	0 1 8 2	0 1 2 4	0 0 5 [illegible]	37 6	3 0 14 5
1760	0 1 14	0 1 4 4	0 0 9 6	36 8	3 1 4 3
1761	0 1 9 5	0 1 4 5	0 0 5	36 6	3 1 4 3
1762	0 1 17 4	0 1 8 3	0 0 9 1	36 5	3 0 16 5
1763	0 1 10 1	0 1 3 3	0 0 6 8	35 5	3 0 17
Total.	3 1 14 7	2 2 8 4	0 2 6 [illegible]	251 4	23 0 2 [illegible]
Mean wt.	0 1 10 67	0 1 4 05	0 0 6 62	35 9	3 0 17 457

The total divided by feven gives the mean weight, &c. &c. of the whole together, as in the preceding line.

" The firft of the above columns (the date of the year not being reckoned) fhews us, at one view, what we may expect a fingle ear of Lammas wheat, feparated from the ftalk, to weigh upon an average; and the fecond what its produce in grain fhould weigh when feparated from the chaff: the next divifion gives the difference, being the weight of the ear and chaff alone without the grain; the fourth, the number of grains in each ear; and the laft, the weight of a cubical inch; which latter we fhall further confider, and fee what will be the mean weight of a bufhel, omitting the odd grains and decimal parts, as immaterial in fo large a meafure.

" As the ftandard Winchefter bufhel contains 2150.4 cubical inches, if the above weight of one, viz. 3 ʒ 17.457 gr. be multiplied by that fum, the product will be 73 lb. 8 oz. 12 dwt. troy. But this ftandard bufhel is in fact too fmall, the real contents of a bufhel dry meafure being 2178 cubical inches, which, according to that calculation, will give 74 lb. 7 oz. 19 dwt. which fums reduced to averdupois weight will ftand as follows.

$$\text{Troy}\left\{\begin{matrix} \text{lb. oz. dwt.} \\ 73\ \ 8\ \ 12 \\ 74\ \ 7\ \ 19 \end{matrix}\right\} \text{equal to} \left\{\begin{matrix} \text{lb. oz. dr.} \\ 60\ \ 10\ \ 8\ 6 \\ 61\ \ 6\ \ 15\ 9 \end{matrix}\right\} \text{averdupois.}$$

" But it will be proper to take notice that none of this corn was weighed till thoroughly dry, and feldom till the harveft after it was got, and fometimes later; therefore there muft be fome allowance made for the lofs of weight by keeping; which I found upon trial to be about four grains yearly in a cubical inch, and confiderably more the firft year, efpecially if the corn happened to be got in a wet harveft: therefore I think we may fairly eftimate the mean weight of a bufhel of wheat, containing 2178 inches, to be about 62 lb. averdupoife weight.

" I know that a bufhel of good wheat is, by the generality of writers upon agriculture, calculated at about 64 lb.; but our prefent enquiry is not whether it is good or bad, light or heavy of its kind; but what is the medium betwixt the two extremes, in order the better to judge of its qualities, according as it falls fhort of, or exceeds, that determined weight.

" The fields out of which the corn was gathered for the above experiments, are moftly fituated within a circle of ten or twelve miles round the town of Warwick, and fome of them in Northamptonfhire; and in foils of different kinds, and fuch as have been productive of good, bad, and indifferent crops.

 " With

" With regard to the obfervations, which I now offer to the public, they may be affured that they have been made with the greateft accuracy, and, barring any errors in the calculations, without the leaft deviation from the truth.

" My method of gathering the ears of corn was, to crop them ftanding during the time of harveft, always endeavouring, as near as I could guefs, to take fuch as were of a middling growth, avoiding the fulleft ears, as well as thofe which were fhrivelled, or ftinted. I therefore generally got them from about the middle fpace between the ridge and the furrow; I then carefully wrapt up the produce of each field in feparate papers, to prevent the corn from fhedding, or intermixing.

" The column which fhews the difference between the weight of the ear with the corn in it, and that of the grains alone, is meant only as relative to the ear itfelf, without the ftalk added to it, which latter was always feparated from it. But I have fince made fome few experiments with regard to the proportional weight between the whole ftalk and ear, and its produce in grain; and I found the former to be to the latter as about fixty-feven to feventy-two. But I cannot depend fo much upon the juftnefs of this calculation, as of the others, it being only tried upon the produce of one harveft.

" It muft be obferved that the weight of corn will vary more or lefs by keeping, according to the nature of the grain itfelf, the feafons that it has had for its growth and maturity, and the drynefs or moifture of it when reaped: for notwithftanding, it was before obferved, that there may be an annual lofs of about four grains in every cubical inch upon an average, yet it may fo happen that the weight of it may even be encreafed by keeping, as was really the cafe with regard to the corn which was got in the harveft of the year 1762, after an exceffive dry fummer; for I found, upon weighing a cubical inch of the fame corn, a year after the firft trial, that it had actually encreafed in weight 2.6 grains, which I can by no means account for, but upon a fuppofition that the corn contained in the ear, having been fo thoroughly dried, whilft ftanding, by the preceding heats and great drought, there was no room for any further evaporation of aqueous particles; but that, on the contrary, being laid up in this extreme ftate of drynefs, it muft even imbibe moifture afterwards, from the coolnefs of the place where it was repofited; by which means the grain would become more plump than when frefh gathered, and would confequently encreafe in weight. From hence the reafon is very obvious, why corn that is thoroughly ripe, and well ended, will undergo a much lefs change by keeping, than that which has been plumpt up by preceding rains, though perhaps it may look better to the eye than the other. But I think it may be laid down as a rule, that the more the external coat of the grain is extended by redundant moifture from within, the more will it appear fhrivelled and wrinkled, whenever that moifture is evaporated, which it muft lofe upon being kept for any confiderable time in a dry place: therefore it will be moft to the advantage of the owner to have fuch corn fpent as foon as it is fufficiently dry for common ufe, and not to hoard it too long in the granary, as the heap from the above-mentioned caufe will be daily decreafing.

" If further experiments of this kind were to be tried in other parts of this kingdom, and even in different climates; and if the refult of each obfervation was to be compared with the others, we might probably come ftill nearer to the medium which we have been aiming at; and the fame trials might be made with any other fort of grain." *Mufeum Rufticum, vol.* II. *p.* 175.

" The experiments made by the above ingenious gentleman are very accurate, though, in my opinion, much too fmall to determine matters of fuch importance: but he has, I think, fallen into a miftake that I alfo did in trying fome experiments upon wheat, viz. in fuppofing that a middling ear is a ftandard for computing the crop. This, indeed, would be the right rule, provided there was a regular gradation in the ears above and below the middle fize: but, in fact, it is otherwife; there are generally more fmall ears than large ones, and yet the corn in the large ears may weigh moft.

" To explain this, let us fuppofe a perfon going to choofe fome middling ears as they ftand in the field: he muft do this either gueffing by his eye, or by meafuring fome of the different fizes, and taking thofe of the middle fize as near as he can. The fizes can only be determined by their length and fullnefs: and if, for example, the longeft are five inches, and the fhorteft one, the medium is three inches. Now, though thofe of three inches are undoubtedly the middle fize, yet, unlefs the weight and meafure of the corn in the ears below three inches are equal to that of the ears above that fize, the calculation of the crop from the three-inch ears will be wrong. This will be feen in the following tables.

" I once took an account of great part of a fheaf of red Lammas-wheat; but having miflaid my notes of it, I fhall at prefent take notice chiefly of an experiment made upon white Lammas wheat, of the crop of 1762. The ears and ftraw of this crop were in general very fhort; but the corn was remarkably fine, full, and heavy. The wheat of this experiment was raifed upon clover lay, and the crop about twenty bufhels upon an acre. A nine-gallon bufhel of this wheat weighed above feventy pounds averdupoife, which is ufually reckoned the full weight of good wheat, though fome will weigh more, as the beft generally did that year.

" In February, 1763, I took fome of this corn out of a middling fheaf, and, as near as I could, of the middle-fized corn: but it was taken out all together, and, without feparating of it. I forted what was thus taken out, into four parcels, nearly according to the length of the ftraw, in order to difcover the proportion between the ears and ftraw of different lengths; but there feems to be little certainty in this.

" Thefe four parcels were weighed feparately, ears and ftraw together; then the ears by themfelves; and, laft of all, the corn when feparated from the chaff.

" I weighed twenty of the firft parcel by themfelves, that had the longeft ftraw, and longeft fulleft ears; and afterwards weighed them fingly, taking the weight and meafure of each, as in the table.

" Being defirous to know the weight and produce of the ears of different lengths, I forted each parcel according to the length of the ears, differing one from another about half an inch; and I weighed thefe fubdivifions feparately, noting the length of the ears, and the number of chefts and grains in each. The length of the ears was meafured from the bottom of the loweft cheft that had any corn in it, to the top of the ear. The longeft ear was three inches and a half, but there being only one of that length, it is included among thofe of three inches and a quarter. The twenty ears firft weighed are included in the fixty-three large ears in this laft weighing.

" Several ears have fome very fmall grains in them: thefe are fet down in the table, but not reckoned in the weight, becaufe I fuppofed them not marketable, and that they would go to the tailing, or off-fall corn. Of thefe fmall grains two thoufand one hundred and eighty-feven weighed an ounce averdupoife. The reft were weighed by troy weight, as below.

The weight of the four parcels.

		oz.	dw.	gr.
250 of the longeft	(the ftraw 28 to 36 inch.	18	18	4
500 of the fecond fize	24 to 32	26	17	16
250 of the third	20 to 26	11	7	20
250 of the fourth	16 to 22	5	4	18
1250 ears with the ftraw		62	8	10

Twenty, with the longeft ftraw, and longeft fulleft ears, weighed fingly,

		Inches.	Chefts.	Gr.
1 ear		3½	20	40
1 do.		3¼	18	41
1 do.		3¼	17	39
1 do.		3¼	17	35
1 do.		3	16	34
1 do.		3	17	35
1 do.		3	17	34
3 do.	each	3	17	101
10 do.	each	2¾	15 to 17	325
20 ears			333	684 = 34.2 grains in each ear upon a medium.

	oz.	dw.	gr.
The corn in thefe twenty ears wd.	1	2	12
The chaff ——	0	5	15
The ftraw ——	1	0	21
The ears and ftraw	2	9	0

" In the first of the following tables are inserted the assortments of the four parcels, by the length of the ears, with the number of chests and grains in each, and the separate weight of the ears, grain, and chaff. I must observe, that by accident I missed taking the distinct weight of the two hundred and fifty smallest ears: they are set down in the table as I computed tham, in proportion to the third, or preceding parcel, which may differ a little from the real weight; but this cannot be much, for the weight of the whole parcel is right.

" In the second table, the length, weight, &c. of the twenty largest ears, are set down in the first line: in the second line are the sixty-three large ears, including these twenty: and the third line contains the two hundred and eighty-eight smallest ears. They are set thus together to give the more easy comparative view of them. The next three lines of this table shew the weight, &c. of all the middle-sized ears, and of all those above and below the middle size, brought thus together also by way of comparison. To these I have added, in the following columns, a calculation of the number of chests in each assortment of ears, and the mean number of grains in each chest; also, the number of grains, and weight of a mean ear, of each assortment.

" The last table shews the total weight of the corn, chaff, and straw, upon an acre, agreeable to this experiment, reckoning the crop at twenty bushels of nine gallons, or seventy pounds, averdupoise, per bushel.

" The very small grains are not reckoned here, for the above reasons; and that the waste in reaping, carrying, threshing, and some left in the straw, is more than they amount to. But by adding them, and allowing for about seven or eight inches long of stubble, the total weight of the crop may be nearly estimated.

A table of the length, weight, &c. of one thousand two hundred and fifty ears, sorted according to their length.

Ears. No.	Length. Inches.	Chests. No.	Grains. Gr. Sm. do.	Wt. of Ears. Oz. Dw. Gr.	Wt. of Grain. Oz. Dw. Gr.	Wt. of Chaff. Oz. Dw. Gr.	Wt. of Straw Oz. Dw. Gr.	Total Weight. Oz. Dw. Gr.
20	2¾ to 3¼	15 to 20	684	1 8 3	1 2 12	0 5 15	1 0 21	2 9 0
7	2½ to 3¼	16 18	215 11	0 8 3	0 6 9	0 1 18		
11	2¾	15 16	300 11	0 11 21	0 9 5	0 2 16		
80	2½	14 15	1930 60	3 13 10	2 17 13	0 15 21	7 11 16	
85	2	11 14	1600 110	2 18 18	2 5 6	0 13 12		
47	1¾	9 12	738 31	1 5 8	0 19 18	0 5 14		16 9 4
250			5467 223	10 5 15	8 0 15	2 5 0	8 12 13	18 18 4
8	3	17 18	265 4	0 10 12	0 8 8	0 2 4		
17	2¾	14 16	443 29	0 17 9	0 13 4	0 4 5		
108	2¼ 2½	14 15	2405 70	4 4 9	3 8 13	0 15 20		
164	2	11 14	2925 145	5 2 14	4 0 0	1 2 14		
203	1¾ 1½	9 11	2727 121	4 10 0	3 10 0	1 0 0		
500		.	8765 369	15 4 20	12 0 1	3 4 19	11 12 20	26 17 16
40	2¼ to 2½	13 16	827 50	1 10 12	1 3 13	0 7 0		
65	2	10 13	1075 70	1 15 15	1 7 14	0 8 0		
107	1½	8 10	1350 45	2 1 13	1 12 17	0 8 20		
38	1	6 7	293 5	0 8 19	0 6 19	0 2 0		
250			3545 170	5 16 11	4 10 15	1 5 20	5 11 9	11 7 20
250	¾ 3¼		1622 78	2 13 13	2 1 16	0 11 21	2 11 5	5 4 18
1250			19399 840	34 0 11	26 12 23	7 7 12	28 7 23	62 8 18

A comparative view of the above one thousand two hundred and fifty ears of wheat.

	Ears. No.	Length. Inches.	Grains. No.	Wt. of Grains. Oz. Dw. Gr.	Chests. No.	Grains per Chest.	Grains in a mean Ear.	Weight of a mean Ear.
Largest ——	20	2¾ to 3¼	684	1 2 12	333	2 . 054	34 . 2	27 . 000 Grains
Large ——	63	2½ 3¼	1907	2 19 14	1012	1 . 884	30 . 269	22 . 696 Troy.
Smallest ——	288	0¾ 1¼	1914	2 8 10	2016	0 . 949	6 . 645	4 . 034
Large ——	291	2¼ 3¼	7069	10 9 5	4318	1 . 637	24 . 292	17 . 288
Medium ——	314	0 2	5600	7 12 20	3849	1 . 454	17 . 834	11 . 681
Small ——	645	0¾ 1¾	6729	8 10 21	6199	1 . 085	10 . 432	6 . 358
Total	1250	0¾ 3¼	19399	26 12 23	14366	1 . 35	15 . 519	10 . 232

Total weight of the crop upon an acre, agreeable to the above specimen, reckoning the same at twenty bushels of nine gallons, or seventy pounds per bushel.

Wheat. C. q. lb.	Chaff. C. q. lb.	Straw. C. q. lb.	Total Produce. C. q. lb.
12 2 0	3 1 23	13 1 7	29 1 2

" Small experiments are not so satisfactory as large ones; and I could wish this had been more extensive, but I had no thoughts of offering it to the public view till I read your correspondent's letter, who has, I apprehend, gone upon a wrong rule in computing a crop, and has also chosen the mean ears too large: for, though the ears of red Lammas wheat are usually longer than the white, it cannot be supposed that, upon an average, they are above double, both in weight and number of grains, as we find those were to the mean ears of this experiment. Neither is it at all probable, that the mean ears of the common crops in any part of England, and in the same year, should be heavier, and contain more grains in them, than the very largest ears of this experiment.

" The ears of this wheat being from three and a quarter to three quarters of an inch in length, the medium is two inches. I have ranged all these together in the second table. They are a fair medium in regard to length; and they are so also as to fullness, because they are all included: but, as appears in the table, they are not so in

respect

respect to the weight of the grain, which is the rule for the medium of the crop; for the small ears are more than double the number of the large ones, and yet the large ears are the heaviest. If, in order to make the number of ears equal, we choose the mean ears shorter than two inches, the inequality of weight will be greater than before; and if we take our medium higher than two inches, the weight may be made equal, but this will encrease the disproportion in the number; and hence I think it is evident, that we cannot fix upon any size of ears that will give us a just medium of the crop. The same will happen in other crops, for they all vary one from another in the size and number of ears: and, as we cannot be certain of their real proportion as they stand in the field, it is impracticable to calculate a crop from those of any size.

"The calculation of a crop from a mean ear is made by multiplying the weight of grain in that ear by the number of ears upon an acre. A mean ear of this experiment weighed, as in the table, 10.232 grains troy, and the crop was about twenty bushels upon an acre. Your correspondent reckons the weight of a mean ear at 24.05 grains troy, upon an average of seven years; so that, reckoning the same number of ears upon an acre as in this experiment, his crops will amount annually to forty-seven bushels per acre, of seventy pounds, averdupoise, per bushel. These are such crops as, I suppose, no considerable extent of contiguous lands in England produce annually; and are, doubtless, more than double the common crops upon an average.

"The disproportion in the number of small and large ears is very remarkable, and also their disproportion in size: for, if we calculate from the twenty largest, we shall find that forty-three of them weighed as much as all the two hundred and eighty-eight small ones, viz. one large ear produced as much corn as seven small ones, and the grain in them also larger, and consequently more flour in them: for one hundred of the large corns weighed seventy-eight grains troy, and one hundred of the small but sixty grains; so that four grains of the large ears were heavier than five of the small. This great difference is not from any defect in the rudiments of these small ears, but is occasioned principally from bad culture, and a defective nourishment; because we see that the plants raised from the same seed will have larger or smaller ears, according as they are cultivated. It might, however, be useful to know at what period of their growth those small ears are stinted, and whether they are produced from the original plant, or from the tillers. I am not furnished with experiments to determine these points, but recommend them to the enquiry of your readers.

"It is certain that the ears of wheat, in general, do not arrive to the size that they are naturally capable of: and if it was known at what period they are formed, the stinting of them might, in some degree, be prevented, by a dressing, or other culture, at that period. That there is some such period in nature, may appear from other circumstances in the growth of this plant. There is a particular season for its tillering, or spreading; another for its upright growth; and one for its blossoming and forming the seed; and probably one also for the ear being formed: and the growth of it, in respect to each of these, may be promoted by culture, or retarded by a defect of nourishment, at these periods.

"When the season of tillering is past, no culture will make this plant throw out more branches; and after the ear is shot out, it is then impracticable to make it larger, viz. to encrease the number of chests. Again, when it has blossomed, no art will cause the stem to rise higher. And, last of all, after the time of blossoming, there is no adding of one grain more than is already formed in the ear; though, in all these cases, an addition, or improvement, may be made by culture, if applied at the proper time.

"It is therefore of importance to know the periods of growth of the different parts of the plant; and that if we happen to miss assisting of it in one, we may improve it in another. If the season is lost to encrease the number of tillers, we may enlarge the ears; or, if that is also omitted, we may encrease the number of grains in the ears, and make them larger and fuller of flour.

"To shew this more plainly, with respect to the grain, let us a little consider the structure of an ear of wheat. The grain is placed in a cell, consisting of two valves, or leaves; and there is one leaf extraordinary on each outside of the chests, which seems intended as a fence, or security, against accidents to the outward grains. The chests about the middle of the ear are the largest, and usually consist of four, five, and sometimes six or seven cells: and the number of cells decreases towards the top and bottom of the ear. If the ear is examined when in blossom, we may see what number of grains each chest is formed to produce: or this may be seen afterwards by the number of double valves, which are properly the chaff; for these remain, though the grains have proved abortive; and therefore, by counting the leaves of chaff, allowing two to each grain, and two extraordinary to each chest, we shall find what number of grains each chest might have produced.

"The outward grains of the chests are commonly the largest, and smaller towards the middle, and often stinted grains, or none at all, in the middle cells; and this, notwithstanding most of these had blossoms in them, and the grains had made some progress, or begun forming. They are later than the outside grains, as if last impregnated.

The number of these deficient, or missing grains, is greater than might be supposed without examining them. In a favourable season most of the cells have grains in them; and, if examined at the time of blossoming, the grains may be seen in different degrees of maturity, many of them with the naked eye, and others with a good glass; but though they appear then in general to be fresh, and in a growing state, a considerable number of them is afterwards stinted, or die away entirely. In an ear of red Lammas wheat, of six inches long, twenty-five chests, and two hundred and eighty-six leaves of chaff, I have counted seventy-four grains some time after blossoming; by which it appears, that this ear might have produced one hundred and eighteen grains; and yet at harvest I have not commonly found above sixty grains in an ear of that length. I have likewise this season counted fifty-four grains in an ear of white Lammas wheat, of three inches and a quarter long, nineteen chests, and one hundred and seventy-four leaves of chaff; so that this ear might have yielded sixty-eight grains: but we see in the above tables, that the fullest ear, of the same sort of wheat, and the same length, yielded only forty-one grains; and three of the same length yielded but thirty-eight grains and one third each, upon an average.

"The tillage and dressing of land for wheat is done, for the most part, before the wheat is sown, and the benefit of these gradually decrease; whereas the wheat requires a gradual encrease of nourishment, both in order to form large ears, and afterwards to fill them with large grain. And hence appears the great defect of the common husbandry, and points out the advantages of top-dressing wheat in the spring with soot, or other light manure, which bring the plants a fresh supply of nourishment when they want it most; and hoeing, when they can be performed at the proper times, particularly the deep, or horse-hoeing, has the same effect of producing large ears; and for filling them, the horse-hoeing is the most effectual, as that can be performed at the critical time, and when the plants are large.

"It has been commonly supposed, by those who practise the new husbandry, that the most important hoeing, for the purpose of filling the ears with good grain, is soon after the wheat has blossomed: but this, I believe, is a mistake, and that it should be performed immediately before the wheat blows; for before that is over, the grain is considerably advanced. I have found no less than seventy-seven grains in an ear of red Lammas wheat, of four inches and three quarters long, and at the same time a considerable part of the blossoms still remaining on the outside of the ear.

"This is above one third more than usually comes to maturity in an ear of that length; so that it seems very probable the ears would produce near one third more corn than they commonly do, were they to be assisted at that time with sufficient nourishment. But this would come too late after the blossoming is over; for by that time, some

ſome of the weak grains die, and others are ſtinted, ſo as not to be recovered again by any future hoeings. A check at this critical time ſeems to have the ſame effect as it has upon a grain of corn, or other ſeed, after it has begun to vegetate: if that is put a ſtop to, it never recovers.

"From the great number of ſmall ears in a crop, and the deficient grains in all the ears, we may plainly ſee the advantage of good culture, and of taking the proper ſeaſons to apply it. The new huſbandry is, in this reſpect, much to be preferred; and alſo becauſe much fewer plants will produce an equal crop; in which there are ſeveral advantages, beſides ſaving above half the ſeed. This method of culture is, indeed, ſo much ſuperior to the common huſbandry, not only in raiſing wheat, but plants of almoſt every kind, that is to be wiſhed it was more promoted.

"I am ſenſible that ſeveral gentlemen have objections to this huſbandry, ariſing partly from a miſinformation of Mr. Tull's practice and ſucceſs, and partly from the difficulty they apprehend in overcoming the prejudices of the farmers to any new methods.

"That they are very tenacious of old cuſtoms, is readily admitted, nor are they to be too much blamed on that account: but that they cannot be prevailed with to alter them, upon rational evidence, and proper encouragement, is, it is apprehended, carrying the argument too far, as this tends to diſcourage all attempts of improvement.

"One of the reaſons aſſigned, why the farmers cannot be brought to practiſe the new huſbandry, is the difficulty of managing a drill-plough for ſowing corn, which is admitted, though that is not ſo great as ſome have ſuppoſed; for I have ſeen a huſbandman learn to manage ſuch an inſtrument, who, after one day's practice, could ſow with it four or five acres a day, with the proper quantity of ſeed, at a leſs expence than common ſowing and harrowing.

"Some have objected farther, that the farmers cannot practiſe this huſbandry, becauſe they are ignorant of its principles: but theſe principles are not many, nor hard to be underſtood, ſo far, at leaſt, as relates to practice; and, in fact, the practice of the new huſbandry is eaſier than the old, becauſe it is founded upon clear principles, which often is not the caſe in the old huſbandry.

"It ſeems that ſeveral gentlemen are not for introducing this new method, becauſe they are not convinced that it is, upon the whole, better than the old. If we may credit thoſe who have gone furtheſt in the practice of the new huſbandry, thoſe gentlemen abroad in particular, who have publiſhed their experiments, there ſeems to be no doubt of its ſuperiority: but as it is a matter of great importance, that this fact ſhould be fully eſtabliſhed to the ſatisfaction of all gentlemen, from whoſe influence and example the moſt valuable improvements are to be expected, the trial is not difficult, nor very expenſive: a ſmall farm, with ſome variety of ſoils in it, cultivated in the ſeveral methods, by way of compariſon, and exact accounts kept of the expence and produce of each, would determine this point without any reaſonable doubt.

"In matters of this ſort, ſpeculations and reaſonings are not to be relied on without experiments; and the larger they are, they will be the more convincing. Whether ſomething, like what is here propoſed, might not have the deſired effect, and likewiſe be a means of making uſeful diſcoveries in vegetation, and the culture of plants, is ſubmitted to the conſideration of thoſe who have at heart the improvement of agriculture.

"A more extenſive plan is neceſſary for introducing new methods into common practice, and which might comprehend the farmers, and alſo the huſbandmen, who execute and excel in the performance. It is recommended to your readers to conſider and propoſe what they think the moſt probable means for attaining theſe deſirable ends." *Muſeum Ruſticum, vol.* III. *pag.* 38.

"It is certain, ſays another ingenious huſbandman, that many ſtrange reports were raiſed of Mr. Tull, and his huſbandry, by prejudiced perſons; and his book being printed for the author, ſome bookſellers were much offended, and employed ſeveral hands to write againſt him, which they did in a moſt ſcurrilous manner, aſſerting many things that were falſe, and miſrepreſenting others. Some of theſe he takes notice of himſelf, in the additional parts of his work. I ſhall mention only one inſtance how ready people were to give credit to ſuch falſe reports. "Laſt ſummer," ſays he, "the vulgar in general believed, in a country but twelve miles diſtant from me, that I always carried my dung and threw it into a river: now there is no river nearer to the barton where my dung is made, than is the fartheſt part of my land; ſo that the expence of loſing my dung would be greater than ſpreading it on any part of my farm. Beſides, I live in a country where farmers buy dung at a good price; but it is known that I neither ſell nor waſte any dung. Againſt ſuch lying tongues there is no defence."

"But a principal cauſe, that the reports of his bad ſucceſs in his wheat crops have gained ſo much credit, I believe, is, that the additions to his Eſſay are out of print, and not generally known; and it is chiefly with a view to inform your readers of them that I write this letter.

"Mr. Tull began his ſcheme of ſucceſſive wheat crops with four rows. Afterwards he found that three rows were better, and was in that practice, of drilling three rows upon a ridge, when he publiſhed his Eſſay. Upon further experience he found, that two rows produced as good crops as three or four, and were more eaſily managed. This he recommends as his laſt and beſt method; and altered his drill-plough to his practice of planting only two rows upon a ridge, of which he gives a cut and deſcription in his Addenda and Concluſion. By this alteration, his drill is much leſs complicated, and leſs difficult to manage, than that for planting three rows, deſcribed in his Eſſay.

"The gentlemen abroad, who are now promoting the new huſbandry, have gone into the practice of planting three rows upon every ridge, ſuppoſing that to be the beſt method; and the drill-ploughs invented by M. Du Hamel, and M. De Chateauvieux, are conſtructed to ſow three rows.

"From the practice of the gentlemen abroad, and other inſtances that might be given at home, it is evident, that they have not ſeen the additions that Mr. Tull made to his Eſſay, in which, beſides his different method of drilling, there are ſeveral very material improvements in the manner of hoeing and cultivating wheat, and other crops; and from theſe laſt parts of his work may be alſo ſeen, that the reports of his bad ſucceſs, in repeated wheat crops, are without any juſt foundation.

"In order to ſhew this more clearly, it may be proper to premiſe a ſhort chronology of the progreſs of his huſbandry, collected from his own account of it; in which it is to be obſerved, that as the year, at that time, was by ſome reckoned to commence the firſt of January, and by others the twenty-fifth of March, and the crops at other periods, it occaſions an uncertainty of ſometimes a year in this account.

Mr. Tull began his horſe-hoeing huſbandry about the year —— ——	1723
his ſucceſſive horſe-hoed wheat crops	1726
He publiſhed his Specimen —— ——	1731
his Eſſay —— ——	1733
his Supplement to the Eſſay ——	1735
his Addenda ——	1737 or 1738
His Concluſion is dated March 31, ——	1739

(All theſe are printed in ſmall folio)

He died about the year 1741.

"As to his practice of raiſing ſucceſſive crops of wheat, he made the experiment firſt upon part of a field, which had not been dunged for ſome time, and upon this part he continued to raiſe wheat for twelve years, without the aſſiſtance of any manure. In the preface to his Eſſay, he ſays, "The particular ſcheme of raiſing annual crops of wheat, without dung or fallow, is as yet only upon probation; but, by the ſix crops I have had in that manner, I ſee nothing againſt their being continued." In the Supplement, page 249, he tells us, "There is now the eleventh crop of wheat on the ſame field, (except that in the ninth year, by accident, of having contracted to let my farm, it was drilled with white oats) and I do not yet ſee any reaſon againſt its being continued for wheat annually, as long as it is kept in this culture." In the Addenda, page 261, "The field which last year had the eleventh crop of wheat," (as in page 249) "has now the twelfth on it, very likely to be a good one." And in the Conclusion, he says, that the twelfth crop of wheat, upon this field, "was the best, I believe, that ever grew on it." "It has now the thirteenth crop, likely to be very good, though the land was not ploughed crossways;" which he mentions it was the year before, in order to alter the size of the ridges.

"I have here collected what he says of this field in particular, as it was his field of experiment, upon which he had raised the most crops of wheat, without any manure. Let us next see what crops he had upon his lands in general.

"He begins his Addenda with acquainting the reader, that he was desired to take an exact account of the crop of an acre of horse-hoed wheat, part of a field of twenty-five acres, in order to see the difference between that and the crop of a small piece of ground, drilled upon the level, and hand-hoed. This acre being measured, and the crop reaped, and threshed by itself, yielded twenty-nine bushels and three pecks of clean wheat, nine-gallon measure. But he observes that great waste was made by the reapers of this acre, and some damage was done to the corn by cattle; for which allowance being made, he reckons the real produce of this acre to have been thirty-two bushels, or four quarters, of wheat.

"He then proceeds to give an account of the crops of wheat upon his other fields, which, including the above-mentioned field, were in all one hundred and six acres. The corn was not threshed when he wrote this; but it appears, by his account of the crop, as I have computed it, that these one hundred and six acres produced, upon an average, nearly twenty bushels of wheat per acre.

"If the quality of this land is considered, none of it rich, and the greater part light, and of a thin staple, this cannot be called a bad crop. But there was another very important circumstance, which ought to be considered: Mr. Tull was now advanced in years, and in a very bad state of health; was frequently confined to his room, and sometimes to his bed; insomuch that, as he tells us, he had not seen some of his crops from the time they were sown till the spring following. And in his Supplement he says, page 225, "My agriculture having been carried on by common day-labourers, without any body to inspect them, (except when my diseases suffered me to attend them, which, for several years last past, has been very seldom) cannot be expected to be all well managed; for though they can do it well when they please, yet their will being above controul, I must be content with their doing some tolerably well every year."

The dust of the master's feet is a kind of manure so necessary in every scheme of husbandry, that no person of experience in such matters, who reflects upon these circumstances, would have reason to be much surprised, if Mr. Tull's crops had really failed as much as has been supposed; and if we also take into the account, that these day-labourers whom he employed, and who had the management of his agriculture at the critical seasons, were then generally, as such men still are, prejudiced against the new husbandry, I think his success, notwithstanding these disadvantages, is a strong argument in favour of this husbandry.

"But let us proceed to what Mr. Tull says further of these successive wheat crops. In the Addenda, page 263, he tells us, "I have now six score acres of wheat, an hundred acres of which are on the stubble of the last years wheat crop.

"And in the Conclusion, page 273, "The crop of the six score acres of wheat, that was growing at the time of publishing my Addenda, was much greater than the crop the year before it, and would have produced more grain in proportion, if the heavens had been as propitious; but the heavy rains that fell when the first-planted was most in blossom, diminished the filling of the ear and its grain, yet not so much as of most sown wheat, especially of the early-sown, which generally escapes the best in this common calamity. The burn-beaked wheat, being always early sown, I am informed had next to no grain in it; and this is the most expensive sort of husbandry, the tenants pay such exorbitant fines for the liberty of ploughing this land."

Again, page 274, "The same six score acres that was wheat the last year, is planted with wheat now, and is all of it as strong and likely for a good crop as in any of the former years, though there is but about one acre of it dunged. The whole is the freest from weeds before hoeing that ever was seen, and the sown wheat in the neighbourhood the fullest of them."

"I can shew, at this instant, one of the experiments I have recommended, which, though it be on less than two perch of ground, must convince every man who sees it (and doth not renounce the evidence of his reason and senses) that pulveration by instruments can vastly exceed the benefit of common manure.

"It is to such experiments that I leave the progress of my horse-hoeing husbandry, assuring the public, that in all my practice, which is now thirteen years, I never have met with one instance that gives me the least suspicion of the truth of the principles I have advanced; and that, I believe, they have nothing to fear from enemies, but the false relation of facts, or fallacious arguments."

"Mr. Tull mentions here, that he intended this to be his last crop. He lived about two years afterwards. Whether he continued to occupy his farm, I am not certain; but if he did, and his crops were worse than the preceding years, that could not be justly attributed to any error in the principles, but to the other causes above mentioned. We see here that he appeals to an experience of thirteen years: nor can it be supposed, or admitted, that a person of Mr. Tull's understanding would go on from year to year to enlarge his plantations of wheat to the extent of one hundred and twenty acres, had he not been fully sensible of the advantage of so doing.

"The repetition of wheat crops upon the same land may, by many persons, be supposed rather a matter of curiosity than of any great use; a change of crops being the general custom, and supposed to be the most profitable: but this is not so clear as some imagine. The custom is founded upon the supposition that change of crops is necessary; which, though it may be true in the old husbandry, is not so in the new; and, without doubt, the change is often hurtful to the farmer; for, not to insist on the extraordinary labour necessary to prepare the land, and the loss of the season, if it cannot be got into proper order in time, or, which is as bad, sowing it, though not in proper tilth to receive the seed, the main point of all is, whether the profit of these several different crops is really more than hoed successive crops of wheat, or other corn commonly propagated? In answer to this, I believe it is not very difficult to shew, by a fair comparison of both, that the hoed crops are the most profitable, even including the clover and turneps in the old husbandry. Nor is a profitable change of the crop, or the advantage of obtaining sometimes three crops in two years, peculiar to the old husbandry; for the same may be had to greater advantage in the way of hoeing.

"There is another circumstance in the old husbandry very unfavourable to the farmer. As he is under a necessity of changing his crops, he cannot adapt them to the soil. Most farms have land in them of very different qualities, and these are not equally proper for the production of plants of every kind. The strong land, that is very fit for beans, wheat, and clover, is not equally so for peas, barley, and turneps. But the farmers commonly vary their crops according to the custom of the country, and the consequence is, that most of their lands are planted in their turn with crops not the most suitable to them; which is an inconveniency that may be avoided in the new husbandry.

"Having pointed out the additional parts of Mr. Tull's work, it is hoped that we shall soon have a new impression; but as it may possibly be some time before the last parts of his work are re-published, I shall, for the benefit of such of your readers as incline to practise the new husbandry, take notice of one or two important alterations in the horse-hoeing culture.

"In the Essay, Mr. Tull directs, that the hoe-plough should be brought as near as possible to the rows at first, and when the plants are young; but that the subsequent hoeings should be at some distance from the rows, lest the plough should tear off too many of the roots, and destroy the plants; also that the last hoeing should throw the earth of the intervals up to the plants, which he thought necessary for their better nourishment, when they were grown large. His last practice was different in both these respects.

"For in the Conclusion, page 272, he says, "At the second hoeing, the plough goes in the furrow of the first, making it deeper and nearer to the wheat: the third hoeing fills up this furrow; and then, at the fourth hoeing, the plough goes in the same place as the second, turning the mould into the intervals. It is remarkable, that though the furrows of the second and fourth hoeings be deep and near to the rows, seeming to deprive the wheat of the mould which should nourish it, whereby one would imagine, that these furrows, lying long open, should weaken or starve it; but it is just the contrary, for it grows the more vigorous: and it is the observation of my ploughmen, that they cannot, at these hoeings, go too near to the rows, unless the plough should tear out the plants.

"If I may presume to assign the cause of this surprising effect, it is in my opinion the following, viz. this open furrow has a double surface of earth, which, by the nitre of the contiguous atmosphere, is pulverized to a great degree of minuteness near the row. The roots that the plough cuts off on the perpendicular side of the furrow, send out new fibres to receive the pabulum from this new-made pasture; and also part of this superfine powder is continually falling down into the bottom of the furrow, and there gives a very quick growth to those roots that are next it, and a quick passage through it into the earth of the interval, where they take likewise the benefit of the other side of this pulverized furrow. When it is said that air kills roots, it must not be understood that it kills a plant, unless all, or almost all, its root is exposed to it, as it is not in this case. Some think there are roots that run horizontally below the plough into the interval; but of this I am not convinced.

"It is not often that we plough above four times, and then the furrow is turned towards the row at the third time only.

"Whether these furrows lying long open next the rows, in very hot dry climates, may be prejudicial, cannot be known but by trials.

"The practical hoer will find this method of going close to the rows of wheat, and other plants, of great service to him; not only in the vigour of his plants, but also in the more perfect tillage of his land, and a considerable saving in hand-hoeing, weeding, and manure.

"The other circumstance, of a large plant growing more vigorous, and the seed filling better, by ploughing the earth away from one side of it, is so singular, and opposite to the common practice of gardeners, that should it succeed generally, it may lead to something new in the theory of vegetation." *Museum Rusticum, vol.* III. *p.* 159.

A comparative calculation of expence and profit between the drill and the common husbandry, taken from Mr. Baker's report to the Dublin society of his experiments in agriculture, for the year 1765. *Published by order of the society.*

An estimate of the expence upon a plantation acre of wheat, in the common husbandry.

	l.	s.	d.
To the first plowing, commonly called breaking, for fallow, eight horses eight shillings; two plowmen one shilling and four-pence; two drivers one shilling	0	10	4
To the first harrowing, four horses four shillings; a driver six-pence	0	4	6
To the second plowing, commonly called gaurowing	0	10	4
To the second harrowing	0	4	6
Carried over	1	9	8
Brought over	1	9	8
To the third plowing, commonly called stretching	0	10	4
To sowing the seed, eight horses eight shillings; two plow-men one shilling and four-pence; two drivers one shilling; the seed-man eight-pence	0	11	0
To seed wheat, one barrel	1	0	0
To rent for the year of fallow	0	18	0
To ditto, the year the crop is growing	0	18	0
	5	7	0

In this account forty shillings are charged for forty horses, employed in the culture of one acre for wheat, in the common husbandry; a charge which ought to be considered by the farmer, for he actually buys and maintains his horses for this business.

The crop which follows wheat is generally oats; but sometimes peas are sown instead of oats; with some, the practice is to let the peas follow oats, in which case they fallow only every fourth year; but where land receives no other assistance than what arises from fallow, it is a bad practice not to fallow every third year. It is the general practice to plow but once for oats, and therefore it shall be stated so; but it is a much better practice to plow the wheat stubble once before winter, and again in the spring.

An estimate of expence upon an acre of oats.

	l.	s.	d.
To plowing once	0	10	4
To seed oats, 2 barrels	0	12	0
To harrowing 4 *s.* 6 *d.* seed-man 4 *d.*	0	4	10
To one year's rent	0	18	0
	2	5	2

These two crops consume three years; after which the farmer is to begin again, and to incur every article of expence stated in the above accounts, in order to obtain two crops more.

An estimate of expence upon a plantation acre of wheat in the drill husbandry, the first year

	d.	s.	d.
To plowing 4 times, to prepare the fallow [This is the same charge as in preparing for the common husbandry.]	2	1	4
To harrowing twice for ditto [This is the same also.]	0	9	0
To rent for the year of fallow [This charge is saved after the first year.]	0	18	0
To harrowing with the drill harrows [Four acres a day may be harrowed with one horse.]	0	0	6½
To sowing with the drill plow [From 3 to 5 acres may be sown in a day.]	0	1	1
To seed-wheat, generally 5 stone, but suppose 6	0	6	0
To the first, or winter hoeing [Two acres may be hoed in a day, two horses, plow-man and driver: the design of this hoeing is to leave the plants dry, and to meliorate the earth.]	0	1	7
To the spring hoeing with the cultivator [To deepen the soil, one horse, plow-man and driver.]	0	1	1
To the 3d hoeing, *i. e.* to return the meliorated earth to the corn [To make the corn tiller, *i. e.* to encrease its branches.]	0	1	7
To the fourth and final hoeing [To fill the grain and render it large.]	0	1	1
To rent, the year the corn is growing	0	18	0
	4	19	3½

N. B. Although the drill culture for the first year is very near as expensive as the common, yet, after taking the first crop, the expence and labour of fallow, and loss of time, is is not to be incurred again, as is unavoidable in the common husbandry.

An estimate of expence upon an acre of drilled wheat, after the first crop.

	l.	s.	d.
To plowing the land once - - - -	0	10	4
[One plowing is all that is necessary.]			
To harrowing with the drill harrow - -	0	0	6½
To sowing with the drill plow - -	0	1	1
To seed-wheat - - - -	0	6	0
[Be it remembered, 5 stone is enough.]			
	0	17	11½
To four times horse-hoeing, as before stated	0	5	4
To one year's rent - - -	0	18	0
	2	1	3½

Thus the land is sown again with wheat every year, and instead of 4 *l.* 9 *s.* which is the farmer's expence in the common husbandry, exclusive of one year's rent of the land: in the drill method it is no more than 17 *s.* 11½*d.* and the total expence, instead of 5 *l.* 7 *s.* is no more than 2 *l.* 1 *s.* 3½*d.* rent included; whereby there is a saving of 3 *l.* 5 *s.* 8½*d.* an acre.

Before the account of profit and loss upon these different methods of culture be stated, it will be necessary to take notice of an objection, which may perhaps be made to the above charge of plowing in the common husbandry. It is pretended, that three quarters of an acre may be plowed in a day, with one plow: but can it be done effectually? The land may, indeed, be scratched, but cannot really be plowed as it ought to be. The farmer ought to be cautioned against a trick too frequently practised in plowing. When a plow-man enters his plow, and passes across the field, he turns a sod about a foot broad; when he is to return, he enters his plow about four feet distant from the outside of the former furrow, and so turns another sod of the same breadth, which, when turned, just meets the former sod; thus four feet of the land appear to be plowed, whereas the fact is, that the two feet lying under the sods is not touched with the plow at all. This deception, added to the practice of just skimming the ground, enables hirelings to undertake plowing at 6 and 7 *s.* an acre. But if a plantation acre of land be well and effectually plowed, 10 *s.* 4 *d.* as charged above, will not appear too much; and it is, in fact, supported by the common course of business. When wheat is to be sown, it is the general custom to send a barrel of seed into the field with two plows, which is to sow an acre of land, and that is the usual day's work for two plows in the general course of business. Let us see then, what the expence will amount to. Eight cattle will be 8 *s.* two plow-men 1 *s.* 4 *d.* two drivers 1 *s.* and the seeds-man 8 *d.* which in all makes 11 *s.* and corresponds with the above charge.

Dr. One acre of wheat and oats in the common husbandry, for fifteen years. *Per Contra*, Cr.

		l.	s.	d.		l.	s.	d.
To the expence on a wheat crop,	2d year -	5	7	0	By the produce of wheat 9 barrels, at 20 *s.*	9	0	0
To the expence on an oat crop,	3d year -	2	5	2	By the produce of oats, 14 ——— at 6 *s.*	4	4	0
To the expence on a wheat crop,	5th year -	5	7	0	By the produce of wheat, 9 ——— at 20 *s.*	9	0	0
To the expence on an oat crop,	6th year -	2	5	2	By the produce of oats, 14 ——— at 6 *s.*	4	4	0
To the expence on a wheat crop,	8th year -	5	7	0	By the produce of wheat, 9 ——— at 20 *s.*	9	0	0
To the expence on an oat crop,	9th year -	2	5	2	By the produce of oats, 14 ——— at 6 *s.*	4	4	0
To the expence on a wheat crop,	11th year -	5	7	0	By the produce of wheat, 9 ——— at 20 *s.*	9	0	0
To the expence on an oat crop,	12th year -	2	5	2	By the produce of oats, 14 ——— at 6 *s.*	4	4	0
To the expence on a wheat crop,	14th year -	5	7	0	By the produce of wheat, 9 ——— at 20 *s.*	9	0	0
To the expence on an oat crop,	15th year -	2	5	2	By the produce of oats, 14 ——— at 6 *s.*	4	4	0
		38	0	10				
To clear profit in 15 years - - -		27	19	2		66	0	0
		66	0	0				

Dr. One acre of drilled wheat, for fifteen years. *Per Contra*, Cr.

		l.	s.	d.		l.	s.	d.
To the first and	2d year's expence -	4	19	3½	By the produce of wheat, 2d year, 6 barrels	6	0	0
To the ———	3d year's expence -	2	1	3½	By the produce of ditto, 3d year, 6 ———	6	0	0
To the ———	4th year's expence -	2	1	3½	By the produce of ditto, 4th year, 6 ———	6	0	0
To the ———	5th year's expence -	2	1	3½	By the produce of ditto, 5th year, 6 ———	6	0	0
To the ———	6th year's expence -	2	1	3½	By the produce of ditto, 6th year, 6 ———	6	0	0
To the ———	7th year's expence -	2	1	3½	By the produce of ditto, 7th year, 6 ———	6	0	3
To the ———	8th year's expence -	2	1	3½	By the produce of ditto, 8th year, 6 ———	6	0	0
To the ———	9th year's expence -	2	1	3½	By the produce of ditto, 9th year, 6 ———	6	0	0
To the ———	10th year's expence -	2	1	3½	By the produce of ditto, 10th year, 6 ———	6	0	0
To the ———	11th year's expence -	2	1	3½	By the produce of ditto, 11th year, 6 ———	6	0	0
To the ———	12th year's expence -	2	1	3½	By the produce of ditto, 12th year, 6 ———	6	0	0
To the ———	13th year's expence -	2	1	3½	By the produce of ditto, 13th year, 6 ———	6	0	0
To the ———	14th year's expence -	2	1	3½	By the produce of ditto, 14th year, 6 ———	6	0	0
To the ———	15th year's expence -	2	1	3½	By the produce of ditto, 15th year, 6 ———	6	0	0
		31	16	1				
To clear profit in fifteen years - -		52	3	11		84	0	0
		84	0	0				

	l.	s.	d.
To clear profit arising upon an acre of land in fifteen years in the drill husbandry - -	52	3	11
To clear profit arising upon an acre of land in fifteen years in the common husbandry -	27	19	2
Greater profit on the drilled acre, in fifteen years	24	4	9

Which amounts to 1 *l.* 12 *s.* 3¾*d.* *per annum*, for fifteen years on the acre, more than by the common husbandry.

In the drill husbandry the crops are stated at three barrels of wheat less upon an acre than in the common husbandry, that it may not be supposed to be over-rated; but in the common husbandry, the crops are rated at the highest; fourteen barrels of oats an acre, are also allowed in the common husbandry, which every farmer must admit to be a great allowance upon the general produce.

That the drill culture will produce six barrels an acre, is fully proved in Mr. Baker's report at large, which will be shortly

ſhortly publiſhed, where it will be ſhewn, that much more has been produced.

Doubtleſs, it will be obſerved, that in fifteen years fourteen wheat crops are obtained in the drill huſbandry; in the common huſbandry only five wheat and five oat crops; the five other years are not only loſt, but are an heavy expence to the farmer.

A farmer having forty acres of tillage, ſuppoſing him to direct his attention to bringing it to the drill culture, would make in fifteen years 969 *l.* 10 *s.* more than he can in the common huſbandry; which is ſuch an advantage, that the greater profit in the drilled acre in fifteen years will purchaſe the fee-ſimple of that in the common huſbandry, at twenty-ſeven years purchaſe, valuing the land at 18 *s.* an acre.

Thus it appears, that in every fifteen years the fee-ſimple of all the tillage lands of the kingdom, is loſt to the community by the common courſe of tillage.

In ſtating theſe accounts, no mention is made of fences, water cutting the land, weeding and reaping, as theſe articles of expence depend on a variety of circumſtances, but, in general, will be more on the common huſbandry than on the drill.

Though we, happily, in this kingdom, are not under the ſame neceſſity as ſome foreign countries, of building large edifices for public granaries, becauſe our harveſts are much leſs apt to fail us; yet as this work is, perhaps too preſumptuouſly, intended for general uſe, it is incumbent on me to ſpeak of thoſe effectual, though expenſive means of guarding againſt dearth, or even famine, as well as of the cheaper and eaſier methods, by which every farmer may be enabled to enjoy the advantage of preſerving a large quantity of corn in a ſmall ſpace, without danger of its heating and fermenting, of its being preyed upon by deſtructive animals and inſects, or of its being ſpoiled thro' the ignorance, or want of judgment, of inattentive ſervants.

Corn reaped in a dry year, and eſpecially that of the growth of a hot country, is well known to be the moſt perfect, and the fitteſt for keeping: as on the contrary, experience has proved that the ſofter and leſs ripened grains of wet years and rainy harveſts ſhould always be diſpoſed of for more immediate uſe, though their too great humidity, which would infallibly occaſion a putrefaction, if not remedied in time, may be exhaled, and they may then be preſerved a long while in very good condition, as will be ſhewn from repeated facts and proper experiments.

The ancient Romans imported annually vaſt quantities of corn from Egypt, a very hot and dry country, ſcarcely ever watered but by the periodical overflowings of the fruitful Nile; and they found this grain anſwer much better than any of their own growth, both for yielding plentiful crops, when ſown in Italy, and for keeping in their public granaries, where they frequently preſerved it many years, perfectly ſound. Pliny tells us, that, in his time, they kept corn a long while in ſubterranean caverns, made in a dry ſoil, and ſo cloſely ſtopped that not a breath of air could enter. They then covered the bottom with ſtraw, and laid upon that the corn in the ear. We have the concurrent teſtimony both of the ancients and moderns, that it will keep thus perfectly well for at leaſt ſix or ſeven years; and an accident, not long ago, diſcovered a parcel of corn thus preſerved at Amiens, where, though it had been laid up during a great number of years, it was found to be freſh and good, neither worm-eaten, rotten, nor mouldy. This was certainly owing to the moiſt air having been kept out, and with it the eggs of animals, and ſeeds of thoſe minute vegetables which we ſee in form of mouldineſs on ſuch corn as has been leſs carefully defended from their acceſs. In effect, experimental philoſophy has proved that the air is the great ſource of corruption; for even the moſt corruptible ſubſtances, ſuch as meal, butter, milk, and the like, have been preſerved freſh four months in the exhauſted receiver of an air pump.

There ſtill is, near Grand Cairo, a vaſt ſubterranean magazine of corn, defended with good walls, and called Joſeph's granaries. It is hardly to be ſuppoſed that they are quite ſo old as the days of that patriarch: but they abundantly prove the utility of ſuch places of ſtore, by the vaſt quantities of grain annually preſerved in them.

Many parts of Africa, the corn of which country, and particularly that about Algiers and Tunis, will keep much longer than the growth of any other place, abound with granaries of this kind. They are deep pits made in the ſolid rock, but juſt wide enough at their top for a man to go down into them, but they grow larger immediately after, and are uſually ſquares of from thirty to forty feet in diameter. In theſe, the great men of the country preſerve their corn. They firſt cover the floor with ſtraw, then ſpread upon that a layer of corn, upon this another, but thin, bed of ſtraw, then another couch of corn, and ſo on, till the whole cavity is filled; obſerving all the while, as the heap riſes, to place ſtraw between the corn and the ſides of the walls. When this is finiſhed, they cover the mouth of the entrance with a ſort of hurdle, over which they lay about two feet thick of ſand, and over this they raiſe a ridge of earth, well beaten together, in order to throw off the rain both ways, that none may ſettle on the place and ſoak into the magazine. The corn thus ſtored up always keeps three, four, or more years very ſound; and not unfrequently the proprietor being taken off by the cruel deſpotiſm of the Eaſtern governments, the magazine is forgotten, ſome accident diſcovers it many years afterwards, and the corn is almoſt always found perfectly good in it. All the care they take, by way of preparing the grain, is to expoſe it two or three days to the heat of the ſun, to dry it thoroughly before they carry it into the magazine.

In the dutchy of Lithuania, and in the Ukraine, the people always preſerve their corn in nearly the ſame manner, in wells or pits made in dry places: but great care muſt be taken there in the opening of theſe ſtores; for people who have deſcended into them, before they had had ſufficient communication with the freſh air, have been killed by the damps.

The Ruſſians too preſerve their corn under ground, in deep pits of almoſt the figure of a ſugar loaf, wide below, and narrow at top. The ſides are well plaſtered, and the top is covered with ſtones. They are very careful to dry their corn well, generally by means of ovens, kilns, or ſtoves, for their ſummer is too ſhort to effect it ſufficiently, before it is laid into theſe repoſitories.

The ſame thing is practiſed with unvaried ſucceſs in the iſland of Malta: and alſo in Gaſcony, the Vivarais, and other ſouthern parts of France, the corn of which is remarkable for keeping many years longer than that of any other province in the ſame kingdom. M. Duhamel tried this method in the Gatinois: but his corn was ſoon ſpoiled there by its humidity when laid up; that country being ſubject to wet and moiſture, and his grain, in this trial, not having been previouſly dried in an oven or ſtove.

Upon the whole, it is evident from theſe, and from many more inſtances, which might be alledged, of the practice of other countries, that ſubterraneous granaries properly made in a thoroughly dry ſoil, are the beſt of all repoſitories for the keeping of corn: but, at the ſame time, experience ſhews that this method will not ſucceed in our climate, the ſun here not having power to exhale the moiſture from the corn, ſufficiently to prevent its fermenting when laid in a large heap. I muſt likewiſe add, that when one of theſe ſubterranean magazines is opened and expoſed to the air, it muſt be emptied immediately, and the corn taken out of it muſt be thoroughly ſifted and ſcreened, or it will ſoon corrupt. Some think it more nouriſhing, when it has been well preſerved, than that which has been kept in granaries above ground.

The marquis of Santa Cruz, author of many excellent remarks on the political and military ſtate of different nations, obſerves, that the corn of Galicia and the Aſturias will hardly keep from one year to another, becauſe of the humidity it contains, which rots and decays it: but that the corn brought thither from Caſtile will keep good many years. This laſt is therefore the only kind that the Spaniards ever venture to lay up in their public granaries: and the ſole difference, in M. Des Landes's opinion, between it and their other ſorts, is, that it grows in a country where there is leſs rain in ſummer. They might indeed, if their religion and policy did not forbid their having intercourſe with the Moors of Barbary, once their conquerors, eaſily import from Africa plenty of ſome of the beſt corn that the world affords, perfectly ripened, thoroughly dried, and, in all reſpects, fit for keeping many years.

The great objection to public granaries, even in countries where the uncertainty of the climate, the indolence of the people, the ill-judged form of government, and various other cauſes frequently combine to render them highly neceſſary, is the expence attending ſuch eſtabliſhments; generally ſo great, that none but a monarch, or a ſtate, can properly undertake them: and they, moſt certainly, cannot do any thing more laudable, more truly noble, in countries whoſe misfortune it is to be expoſed to the dreadful calamities of want and famine, or to depend upon the precarious aſſiſtance of their neighbours.

Though ſubterranean repoſitories for the keeping of corn are preferable to all others in countries proper for them; yet, even the common granaries may, with due care, and perhaps ſome few alterations, be rendered much more ſerviceable than they generally are. The principal cautions neceſſary to this purpoſe are, 1. To guard againſt the too great humidity which always prevails in places where there are many doors and windows: 2. To prevent a too free acceſs of the external air, becauſe this brings in with it the eggs of a vaſt number of different inſects, which prey upon and deſtroy the corn: and 3. To take care that the corn be thoroughly dry, and as clean as poſſible, when it is laid up. Theſe are the three general rules to prevent its corrupting.

The chief cautions to be obſerved in the erecting of granaries are, to make them ſufficiently ſtrong, and to expoſe them to the moſt drying winds. Sir Henry Wotton, and Mr. Worlidge agree particularly in theſe; both judiciouſly adviſing a northern aſpect for theſe buildings, becauſe that quarter is cooleſt and moſt temperate; and the latter rightly obſerving, in general, that the beſt granaries are thoſe built of brick, with quarters of timber wrought in the inſide, whereto to nail well joined boards ſo cloſely to the wall, that there be no room for vermin to ſhelter themſelves. Floors of plaſter are reckoned the beſt, becauſe they are cool in ſummer, and if well made, do not retain dampneſs in the winter. There may be ſeveral ſtories one above the other; for the ſhallower the corn lieth, the better it will keep, and the more eaſily it is turned. Some have a ſmall hole in the floor of their upper granary, thro' which the corn deſcends into the lower one, like the ſand of an hour-glaſs; and after it is all come down into the loweſt granary, it is conveyed back into the upper one; ſo that it is kept in continual motion, which is a great means of preſerving corn.

The granary in the city of Schönbank, in the vale of Parinburg upon the river Elbe, which is a ſtore-houſe for the wheat of which the mum is made at Brunſwick, is built nearly in this manner. It is three hundred feet long, eighteen feet wide within, has ſeven ſtories, each of which is ſeven feet high, and large windows all around, to open and ſhut cloſe according as the wind ſits. By this means, the droſs and duſt are carried off as the corn is turned; for which a weſt wind is always preferred, becauſe it is the drieſt. At each end of this granary, and in the middle, are ſtoves for fire in damp weather, and at the going away of great froſts and ſnows, to prevent moiſture. There are alſo on each ſide of this building three long troughs or ſpouts, in the upper loft; and in fair weather men throw the corn out of this loft into thoſe ſpouts, through which it falls into others, about ten feet wide at the top, and eight or ten inches at the bottom, by which it is conveyed into the lower ſtory, from whence it is wound up again by a crane fixed in the upper loft. By thus falling from one ſtory to another, the corn is cleanſed by the wind from all duſt and chaff, and receives the benefit of the air, &c. Theſe troughs, or ſpouts, are put on and taken off as occaſion requires, to any of the windows; that when veſſels come to lade corn, it may be conveyed, through them, into the proper barges, without being carried thither by men, or cattle. The wall of the two firſt ſtories is two bricks and a half thick, that of the three next is two bricks thick, and the thickneſs of the two uppermoſt is a brick and a half. Fourteen thouſand quarters of corn may be kept in this granary.

Mr. Mortimer, who gives us this account, which is taken originally from captain Andrew Yarranton's England's improvement by ſea and land, adds, that the ears of corn, cut off from their ſtalks, and packed up cloſe in a tight caſk, will keep very well, and that this is the beſt, he indeed ſays, the only way of carrying any ſort of corn over the ſea, in order to ſow it in a foreign country.

The public granaries at Dantzick are ſeven, eight, or nine ſtories high, and have a funnel in the middle of every floor, to let down the corn from one to another. They are built ſo ſecurely, that the corn does not contract any damp, though they are ſurrounded with water on every ſide, in ſuch manner that veſſels come up to the very walls for their lading, which is let down into them, likewiſe thro' pipes or funnels, with very little labour and charge. No houſes are ſuffered to be built near them, for fear of accidents by fire.

At Zurich, in Swiſſerland, corn is kept eighty years, or more, in the public granaries, which are very ſpacious, and well aired by means of many ſquare wooden pipes which paſs through them.

The twelve companies of London, with ſome other companies and private perſons, had formerly their granaries at the bridge-houſe in Southwark, under the ſuperintendance of a juſtice of the peace, a ſteward, and two maſters. Theſe granaries were built on two ſides of an oblong ſquare (now uſed for a wharf,) one of which ſtood north and ſouth, and was near an hundred yards long. Along this ſide were lattice windows which faced the north-eaſt; and on the other ſide, which was about fifty yards long, the windows looked to the north. The oppoſite ſides had no apertures. All the windows were about a yard high, without any ſhutters, and ran on in a continued ſeries, with very ſmall partitions, ſufficient only to nail the lattices to. Each of theſe granaries was three or four ſtories high; but the loweſt, or ground ſtory, which was twelve feet high, was uſed only for a ware-houſe.

In Kent, two ſquare holes are made at the end of the floor, and a round one in the middle, by means of which the corn is thrown from the upper into the lower rooms, and back again, the better to turn and air it. The ſcreens uſed on this occaſion are made with two partitions, to ſeparate the duſt from the corn. The duſt falls into a bag, and when it is ſufficiently full, it is thrown away; the pure and good corn remaining behind. By theſe means corn has been kept thirty years in this country: and it is obſerved, that the longer it is kept, the more flour it yields in proportion, and the purer and whiter the bread is; only the ſuperfluous humidity evaporating in the keeping: for grain does not diminiſh in weight or bulk, after the firſt year.

The uſual way of preſerving it in our common granaries is, after it has been well ſifted and ſcreened, to ſpread it upon the floor about ſix inches thick, to turn it twice in a week, and to repeat the ſcreening of it once a week, during the firſt two months. It is then laid a foot thick, for two months more; and in this time it is turned once a week, or twice, if the ſeaſon be damp, and now and then it is ſcreened again. At the end of five or ſix months, it is raiſed to the thickneſs of two feet, turned once a fortnight, and ſcreened once a month, or as occaſion requires. After a year, it is laid two feet and a half or three feet deep, turned once in three weeks or a month, and ſcreened in proportion. When it has lain two years, or more, it is turned once in two months, and ſcreened once in three, and how long ſoever it is kept, the oftener it is turned and ſcreened, the better the grain will be preſerved. An empty ſpace, about two feet or a yard wide, is always left on each ſide of the corn, to prevent its running down holes or chinks at the edges of the floor, and to remove it from all moiſture that may proceed from the ſweating of the walls, or from any defect in the roof; and another ſpace is commonly left along the middle of the heap, if it be a wide one, to facilitate the turning of it as often as is needful. This is the general cuſtom; and experience has ſhewn it to be neceſſary in the uſual manner of keeping grain.

But all the foregoing methods of preſerving corn in granaries above ground are attended with very great expence, by reaſon of the vaſt buildings, which they require, and the many ſervants neceſſary to be employed to take care of theſe ſtores: beſides which, too much depends here upon the aſſiduity, ſkill, and probity of thoſe ſervants; and the grain is is ſtill liable to be preyed upon, waſted, and ſpoiled, by vermin and inſects.

To obviate theſe inconveniencies, and to point out an eaſier, cheaper, and ſurer way of keeping all ſorts of grain, is the principal deſign of M. Duhamel's excellent Treatiſe on the Preſervation of Corn; in which, after rightly noticing the ſeveral diſadvantages attending the common practice, he propoſes a method founded in reaſon, and on his own repeated experience, as well as that of others, whereby a large quantity of corn may be preſerved in a ſmall ſpace, during a number of years, without danger of its heating, fermenting, or contracting a bad ſmell or taſte, and ſecure from the ſpoil of animals and inſects, at a trifling expence, and with very little trouble. All theſe deſirable ends may be obtained, in ſome caſes, by ventilation only; in others, by drying the corn in a kiln over a ſtove; and in others again by both theſe methods. *See the article* VENTILATION.

A letter to Dr. Templeman, ſecretary to the ſociety for the encouragement of arts, manufactures, and commerce, deſcribing a new-invented granary for preſerving grain.

"SIR,

"Where public utility is in queſtion, a private apology becomes unneceſſary: accept, therefore, without ceremony, the following hints to be laid before the ſociety.

"I have long been of opinion, that a method of preſerving grain from decay is much wanting; but it muſt be, to anſwer any good purpoſe, eaſy in its execution, and cheap in its proceſs.

"The method now practiſed, of laying wheat in a room or granary, and turning it frequently with ſhovels, and ſometimes ſcreening it, is ſubject to many inconveniencies: it muſt be laid very thin, or it is apt to ferment; and by being laid thin it takes up ſo much ſpace, that to lay up and keep five hundred quarters for three years only, would be conſiderably expenſive.

"Could we preſerve our corn for a number of years, it would not only be of great ſervice to the public, but of no ſmall benefit to the farmers. For want of doing this, we find a great, and often a ſudden, variation in the price of bread-corn: wheat will one year ſell for five pounds a load, (that is, five quarters) and the next year it will riſe to fourteen or fifteen pounds or even higher.

"The rents of lands are of late greatly riſen, owing to the encreaſe of our trade; ſo is the price of all kinds of labour, inſomuch that when wheat is low in price, the great farmers are conſiderable loſers, and the poor ones are ruined: this is one reaſon why our lands are ſo much monopoliſed as they are in ſome counties. The great farmers, being rich, can afford to be loſers for ſeveral ſucceſſive years, as they are ſure that once in a while the markets will riſe, and not only repay all their loſſes, but ſecure them a large profit. The poor farmers are under a neceſſity of ſelling their corn before the winter is paſſed: if the markets are low, they fail in the payment of their Michaelmas rent, their ſtock is in conſequence ſeized, and ſome over-grown monopoliſer in the neighbourhood adds their little plot to the many formerly ſeparate farms he already holds.

"Were the intereſt of the community to be conſulted, no man ſhould be allowed to rent above three hundred acres of land: the profits of ſuch a farm will, with proper regulations, maintain a family decently and well; and it is not requiſite, or even ſalutary, that farmers ſhould acquire large fortunes.

"But to return to my ſubject. Were a proper method projected for keeping wheat good for a number of years at a ſmall expence, all this would be remedied, our lands would no longer be monopolized, and corn would from year to year vary very little in price. This ſtands to reaſon; for in a very plentiful year a farmer would not ſell his corn too cheap, if he had the power in his hands to lay it up without great charges; and when the crops by any accident failed, the price of corn would not greatly riſe upon the poor manufacturer and labourer, as what had been ſome years before laid up would now of courſe be ſold at a reaſonable price, and make up the deficiency, and this without loſs to the farmer, and with great benefit to the community in general.

"This intereſting ſubject has, for many years, employed my thoughts and attention; and I have in conſequence imagined, and even executed in miniature, or rather in ſmall dimenſions, a plan, which will, I have reaſon to think, anſwer the important purpoſes above mentioned: my whole plan conſiſts in building a proper granary, (the conſtruction of which will not coſt much) which will keep corn for any number of years ſound, ſweet, and good, and that with very little annual expence.

"I imagine the following poſtulata will be allowed.

"If we can preſerve corn from fermentation, it will be in a way of keeping.

"To keep it from damp and moiſture, is the beſt means of preſerving it from fermenting.

"To move it frequently, give it air at proper times, and ſeparate the duſt and other extraneous matter, is certainly the beſt way to keep it from being moiſt and damp.

"Deſtructive inſects are to be kept from it, which by frequent ſtirring is beſt effected.

"I imagine there are few, who have made this part of nature their ſtudy, but will allow the above poſitions: I ſhall therefore, without farther prelude, inform you in what manner I effect this at a ſmall expence.

"The granary I would recommend conſiſts of ſeven ſtories of floors, and may be built in any dimenſions, provided proper proportions are adhered to.

"The form of it is ſquare; and I ſhall at preſent ſuppoſe it to be fourteen feet ſquare within the rooms or cells; the diſtance of the floor from one cell to the floor of that above it is to be five feet: and the whole building ſhould ſtand on ſtrong poſts, more or leſs in number according to its dimenſions, at the diſtance of ſix feet from the ground: the ſmall ſtairs, or rather ladder, to go to the ſeveral cells, muſt be fixed to the outſide of the building ſide-ways, with a leading rail or rope to prevent falling.

"The whole granary is to be built of what is generally called brick-noggin; that is, the whole is firſt framed in ſtrong timber-work, and the interſtices filled up with brick-work: the floors, beams, and joiſts, muſt be made ſtrong to bear the weight of the corn; the inſide of the cells muſt be well lined with dry oak-boards, cloſe jointed, ſo as to leave no cracks; and the outſide muſt be weather-boarded, the boards being ſtrongly nailed to the timber-work of the frame, and afterwards payed over with pitch. The floors of the cells muſt be ſo contrived as to ſhelve towards the middle, in which part is to be an aperture ſix inches ſquare, to be opened, or cloſed, by means of a ſliding ſhutter, which muſt have a long handle reaching in a groove without the granary.

On three ſides of the rooms there muſt be a window, ſtrongly latticed, covered with wire to keep out larger inſects and birds, and with ſtrong ſhutters to defend the corn from the weather: on the fourth ſide is a door to each room to open from without: the windows are to be ſmall, and as cloſe as poſſible to the cieling: over the upper room or cell for the corn is a loft, on the outſide of the door of which is fixed a crane to be worked within, by a winch and flyers.

"The uſe of the windows in the ſides of the rooms, is to give the corn all the benefit it can receive from the wind and freſh air: the door, when the cell is empty, gives the workmen entry to ſweep, duſt, and clean it.

"My method of managing my corn in this granary is as follows.

"When my wheat is thraſhed and cleaned, it is put up into ſacks and carried to the granary: the apertures I mentioned above to have been contrived in the floor of the cells are then opened, except two, viz. one in the floor of the undermoſt cell, and that in the floor of the ſecond cell, reckoning from the bottom.

"The ſacks are then craned up into the loft, and emptied, through a hole made for the purpoſe, into the uppermoſt cell, whence it falls through the apertures till it reaches the floor of the undermoſt cell but one, where it is ſtopped by that aperture being ſhut.

"When this cell is filled to the height of about two feet from the floor, which may be ſeen through the lattices, the aperture in the floor of the third cell is ſhut by means of the ſlider: the workmen then continue craining up the ſacks till all the cells are filled in the like proportion,

tion, except the undermost, observing the proper opportunities of shutting the apertures.

"In this condition the corn is left for a week, or somewhat longer, if it was got in very dry.

"The first stirring it receives, occasions very little trouble: when it has been in the granary about a week, a workman, after having swept and cleaned the undermost cell, which was left empty, opens the aperture in the floor of the second cell, by drawing the slider back: this lets the corn fall from the second, into the undermost cell, the windows of which being open, the corn receives great benefit, as it falls, by the current of air that passes through the cell.

"When the second cell is empty, the aperture in the floor of it is shut, and the workman, going in at the door, by means of the stairs on the outside of the granary, sweeps it and cleans it from all impurities, in order to prepare it for receiving the corn of the third cell, the aperture of which is next opened, and the floors being all made shelving towards the middle, the corn falls gradually through, in the same manner it did from the second to the undermost cell.

"In this manner they are all managed, till at last the uppermost cell remains empty.

"It is then left for another week, when two workmen must for a small space of time be employed: one of them goes up into the loft at the top of the granary, to work the crane, and the other takes his station on the ground under the floor of the undermost cell: under the aperture in this floor he first fixes a screen, upon which the corn falls, and then, by means of a conductor at the foot of the screen, drops into the mouth of a sack which hangs to it, the bottom of the sack resting on a miller's hand-barrow: when all is prepared, he draws away the slider, and lets the corn fall on the screen.

"When the sack is full, the slider is for a moment closed, till another sack, on another barrow, is put under the conductor: the workman then wheels the first sack to the outside of the granary, and fastening the crane-rope to it, makes the signal for the other to draw it up. Whilst this is doing, the second sack is filled, which is wheeled and drawn up in the same manner; and this method is pursued till the undermost cell is empty.

"If it is necessary to screen all the corn at this time, a small screen is fixed under the aperture of the second cell, so contrived as to have a box at the back of it, which receives all the dust, trash, off-corn, and seeds of weeds that pass through the wires; and this screen is successively fixed under every aperture, as the cells are successively emptied.

"After the first month the corn need be stirred in this manner only once a fortnight, and after the first six months, only once a month, unless the weather should prove, in autumn, very hot and damp.

"This then, Sir, is the manner in which I have for some years managed my wheat, and find it answers very well, the vegetative quality of the corn being preserved in full vigour, and no signs being discoverable in it of a tendency to fermentation.

"My country hovel is at some distance from London, in a retired quarter, consequently unnoticed; and there being but little probability of this easy method's being sufficiently known by my practising it, is the reason of my troubling you with this long letter, flattering myself that by your means it may make a proper appearance in public. Had vanity been my predominant passion, I might have presented it to the society in person, which as a member I had an undoubted right to do; but this would have been encroaching on my beloved obscurity: to you, therefore, Sir, do I trust this child of my invention; and if in your hands he can be trained so as to be of public utility to my country, my every purpose is fully answered.

"I forgot to observe, that I have lately seen Monf. du Hamel's methods of preserving grain, by means of chests with false bottoms and ventilators.

"This method may in some cases be of service, I allow: but I am nevertheless of opinion, that corn cannot be properly preserved, unless the whole bulk of it be frequently stirred, which by du Hamel's method is not done: could the current of air be equally distributed over the whole chests, and in due proportion, I should still think it insufficient to preserve the corn; and if corn has been kept for some time in that manner, I should rather be apt to attribute it to Monf. du Hamel's first drying it on a kiln, before he puts it into the chests, than to any regular effect of the ventilators.

"Were I acquainted with this gentleman, I would recommend it to him, to make an experiment of his method in the following manner.

"Let him first fill a chest with dry corn that has not been on the kiln: another chest should be filled with some that had been well dried, and a third with the same dried corn: let the first and second chests, at proper intervals, be ventilated, and the third be kept without ventilating, in a dry place. Were this done, I am apt to think, that after six months, or a longer time, there would not be found so great a difference as some may imagine, betwixt the corn which was, and that which was not, ventilated.

"In my method, the expence, as well as hazard of drying is avoided, it being never necessary, unless when corn is got in very soft, in a wet harvest; and then a common malt-kiln answers the purpose very well.

"I should have mentioned, that in my method of preserving corn, when by frequent stirrings it is become hard and brittle, it may be laid to the height of three feet, on the floors of the cells, without any danger of damage ensuing; for when it is hard, it is not subject to heat and ferment; neither are insects so fond of attacking it.

"I have by this time, perhaps, tired your attention, and to be plain, am not unweary myself; shall therefore conclude with assuring you that I am, Sir,

Your very humble servant,
A Member of the Society."

"In order to form an idea of the expence of public granaries for corn, says an ingenious correspondent of the editors of the Museum Rusticum, it will be necessary to examine some of those in other countries, that are recommended for our imitation; such as that at Schoonbank on the river Elbe, which is three hundred feet long, and eighteen feet wide within; has seven stories, each story seven feet high, with a row of windows round each story, to be opened in dry weather to air the corn, and blow the dust out of it when turned. A path of a yard wide is left next the walls, all round the corn in each story; and another path across the middle, of two yards wide. In these are trap-doors, to let the corn run down from the upper to the lower stories, to screen and air it: whence it is drawn up again with cranes, or other engines. Stoves are likewise to be placed in the middle, and at each end of the granary, to dry the corn in damp weather. At first the corn is to be laid about six inches thick on the floors, and to be often turned, aired, and screened: in about a year it may be laid two feet thick; and the turning and screening being continued at proper intervals, it may, at the end of two years, be laid two and a half, or three feet thick: and being by that time perfectly dry, turning it once a quarter, will keep it sound many years.

"This is the method proposed for preserving corn in England. But as we are assured, by M. Duhamel, in his Treatise on the Preservation of Corn, that they usually lay it but eighteen inches thick in France, we cannot suppose it proper to lay it thicker in England, both on account of the greater moisture of our climate, and quality of the corn, which in wet seasons is not fully ripened in England, nor can it then be got in perfectly dry. And, though in hot dry climates, they lay it much thicker than in France: that is, because their corn is perfectly ripened; and their wheat of a different species from ours. The Lammas, which is generally esteemed in England, is a full plump fat grain; and, therefore, more difficult to be preserved sound: whereas, most of the foreign wheat, of the warmer countries that I have seen, is a drier and harder grain; and such were several parcels that I have received from Smyrna, Sicily, and Italy: being of the cone or bearded sort.

"It is, also, to be remarked, that the quantity, which can be kept in such granaries, has been greatly over-reckoned. Mortimer has implicitly copied from Yarranton, and others from both, that such a granary as the above, would contain fourteen thousand quarters of corn. But a quarter, nine gallon measure, being 11.2 cubic feet, and each ſtory, after deducting the paths round and acroſs the middle, being only three thouſand four hundred and fifty-ſix ſquare feet, all the ſeven ſtories will contain no more than three thouſand two hundred and forty quarters of corn, laid eighteen inches thick; which is but about one-fourth of the quantity they have ſuppoſed. Mr. Dobbs is more moderate, when he reckons, in his Eſſay on the Trade of Ireland, that a granary of the above dimenſions will contain fourteen thouſand barrels; but he ſuppoſes the corn to be laid two and a half, or three feet thick. He calculates the expence of erecting ſuch a granary, built with bricks, and of a ſufficient thickneſs and ſtrength, at fifteen hundred pounds; and eight or ten pounds a year each to ſix men, to turn and ſcreen the corn, and forty pounds a year to a clerk. This calculation was made for Ireland about thirty-five years ago, but is much too low for England; eſpecially as ſuch granaries are erected near cities and populous towns, where materials and labour are dear: for the building would coſt conſiderably more in England, and the wages double: alſo the clerk would deſerve a ſuitable appointment for the care and conſtant attendance neceſſary in a buſineſs of ſuch truſt and importance; nor would one clerk and ſix men be ſufficient, to do all the buſineſs, and alſo to take in and deliver out the corn: and therefore the clerk and men, at a moderate reckoning, would coſt two hundred pounds a year.

"But there is another article that Mr. Dobbs has omitted, which cannot, nor is it proper to be done by the clerk. One or more perſons muſt be employed to buy the corn; which, at the rate of the uſual commiſſion for buying in private trade, will coſt one ſhilling per quarter: to this is to be added the expence of fuel, of repairs, intereſt of money, and alſo for the waſte of corn in drying and ſkreening, which, according to M. Duhamel's experiments, amounts to about a tenth part of the whole.

"The expence of erecting granaries in France, is by this gentleman computed at a much higher rate than the above. For, he ſays, that a granary, to contain two thouſand ſeven hundred cubic feet of corn, which is about two hundred and fifty quarters, will coſt in France eight or nine hundred pounds. So that if the corn was bought at twenty-four ſhillings per quarter, the granary would coſt near three times as much as the corn contained in it.

"The principal corn, to be preſerved in granaries, is wheat: of which, the quantity produced in England is uncertain. The author of the Eſſays on Huſbandry computes the wheat, barley, and rye, annually produced, at near fifteen millions of quarters, over and above what is uſed for feeding and fattening cattle, &c. and for malting, diſtilling, and ſeed: and, as probably about a third part of theſe crops is wheat, the quantity of wheat remaining for bread, and other domeſtic uſes, may be about five millions of quarters; and this would be the proviſion of wheat for a year, to be laid up in public granaries, beſides rye, and ſuch other ſorts of corn as might be kept for a ſhort time. But I ſhall ſtate a year's proviſion of wheat at no more than four millions of quarters, and charge nothing for keeping any other ſort of corn.

"I do not find, that thoſe, who recommend public granaries, have determined what quantity of corn they thought neceſſary to be laid up in them. The ſtate of Genoa had always, in their public granaries, ſeven years proviſion of corn before hand. This ſeems to be a very ample proviſion; and I ſhall, in favour of theſe granaries, ſuppoſe, that leſs than half this, or only three years proviſion, may be ſufficient for England, at a medium of the granaries being full when corn is cheap, and near empty in a dear time of the longeſt continuance. But to have this quantity always before-hand, or even leſs than this, it is neceſſary to provide ſtore-room for more than three years proviſion, to be laid up in cheap times; and alſo room to ſpare, in order to lay the corn thin at firſt; and for it to run from the upper to the lower ſtories, when ſcreened and aired. And, therefore, if we ſuppoſe, that room for only four years proviſion may be ſufficient, this will alſo be allowed as favouring the ſcheme of granaries. But after all theſe abatements, to have room for four years proviſion of wheat at firſt, or when the granaries are quite full, there muſt be four thouſand ninehundred and thirty-eight ſuch granaries, as that above deſcribed: for ſo many will be neceſſary to contain ſixteen millions of quarters.

"To determine what advantage theſe granaries may be of to the public, we muſt fix ſome price for the prime coſt; and, alſo, how much it may probably ſell for. The markets are governed by the quantity produced: which, being variable, the prices will be ſo likewiſe; and the granaries cannot be always filled when wheat is cheapeſt. For, in that caſe, much more room would be neceſſary than is here ſuppoſed. But, in general, the granaries are to be filled, when wheat is under the middle price; and ſold out when above it: and, therefore, the prime coſt will be nearly the mean between the common and loweſt prices; and the ſelling price the mean between the common and higheſt. Theſe, according to Windſor market, for ſeventy-five years, ending in 1762, (admitting wheat to fall five ſhillings per quarter, upon diſcontinuing the bounty) are nearly twenty-ſix ſhillings and ſix-pence half-penny, and forty-four ſhillings one penny half-penny per quarter; and the difference between theſe, being ſeventeen ſhillings and ſeven-pence per quarter, is the profit accruing to the public from theſe granaries, upon ſo much as is ſold every year.

"Howmuch this profit would amount to every year, is uncertain, as it depends upon the quantity ſold in a year, which cannot be determined: but, if the whole quantity, lodged in theſe granaries, were to be ſold once in ſeven or eight years, the annual profit would fall very much ſhort of the expence: as will appear from the following ſtate of it, viz.

	£
To firſt coſt of erecting four thouſand nine hundred and thirty-eight granaries, at fifteen hundred pounds each - - - - - - - - - -	7,407,000
To three years proviſion of wheat, being twelve millions of quarters, at twenty-ſix ſhillings and ſix-pence half-penny per quarter - - - - - - - - - - - - - - - -	15,925,000
To commiſſion for buying, at one ſhilling per quarter - - - - - - - - - - - - -	796,250
	24,128,250

To intereſt of this ſum - - - - - - - - - - -	1,206,912
To clerks and men - - - - - - - - - - -	987,600
To repairs, fuel, &c. and waſte of corn, above - - - - - - - - - - - - - - -	305,488
	2,500,000

"Thus there is above twenty-four millions ſunk, and two millions and a half a year expence. The profit upon the wheat ſold, and the bounty together, will ſcarce pay half this expence: and though it is not pretended that this eſtimate is accurate in every particular; yet, if upon the whole, it is any thing near the truth, the ſcheme of public granaries will not, I think, be either expedient or practicable.

"The next thing to be conſidered is, whether, after all this expence, corn would be cheaper; and if it were, what effect this would have upon agriculture?

"It has been ſuppoſed, that, upon diſcontinuing the bounty, wheat would of courſe fall five ſhillings per quarter; and likewiſe that the ſame quantity would be ſtill exported. Now it is certain, that all the wheat produced in England, is either conſumed at home, or exported: and, therefore, the wheat exported is all that can be ſpared for the granaries. The quantity exported yearly, at an average of twenty-five years, ending in 1756, was three hundred and forty-five thouſand eight hundred and twenty-three quarters: ſo that, if all the wheat exported were to be lodged in theſe granaries, they would not be full in leſs than thirty-five years, even if none were to be ſold out of them, in all that time: which is a further argument, that ſuch granaries are impracticable; or, that, if they could be introduced, they would put an entire ſtop to the exportation; and, conſequently, occaſion a further and very great loſs to the nation.

"It is often ſaid, in favour of theſe granaries, that they would be a ready market for the farmers, when corn was cheap. But the intention of them being to ſink the price of corn in general, it is but poor encouragement to the farmers, that they must always sell at a low price. This, however, could be but temporary; for the bounty being taken away, the price sunk, and the farmers confined to one market, corn would become an unprofitable crop to them: for which reason they would undoubtedly raise less corn than they do now; and then, of course, it would be dearer. Those, who advise the bounty to be discontinued, and to erect public granaries, are sensible this would be the consequence; and, therefore, propose, that other encouragements should be given to agriculture in lieu of the bounty. But, till it is shewn what other can be given equal to the bounty, and a free trade, it will be safest to pursue the same measures, that have been found so long successful.

"Though it is the practice of several countries, to lay up corn in magazines, it may not be proper to do so in England. In large kingdoms, where the interior parts are remote from the sea, or navigable rivers, it may be necessary to save corn in magazines; and also in populous states, that have a small extent of territory, such as Holland. As the policy of the Dutch, in this respect, has been greatly magnified, and their example recommended for England, it may be proper to take notice here, that their circumstances being very different, what is necessary to one, may be not only improper, but very prejudicial to the other.

"The province of Holland, though only about a fifth part larger than Kent, is computed to contain above two millions of people. The soil, in general, is of a bad quality, and improper for corn; of which it is reckoned, they do not raise enough for a tenth-part of the inhabitants. So that about two millions of them must have corn from other countries; and, therefore, they are under necessity of laying up enough in magazines for their constant supply But their magazines are not intended solely for the use of their own people; but also to lay up corn, when they can buy it cheap, to sell it again wherever they can get a profit by it. So that if they did not want to buy for their own people, they would, notwithstanding, have magazines of corn for trade; as they have for all kinds of merchandize: and, therefore, if we ought to imitate the Dutch in erecting magazines for corn, why not for all other goods, and make all our ports free?

"And herein lies the mistake of those, who recommend the same policy for both countries, though their circumstances are widely different. Holland is but a small tract of bad land, and produces very little for manufactures, or trade. England, on the contrary, with about three times the number of people that are in Holland, contains about thirty times the quantity of much better land, in a better climate; and has a large native product, sufficient for the inhabitants, and, also, for a considerable foreign trade. The land and product of England, are a large part of the riches of the state, and of individuals: and, therefore, in all deliberations concerning the public, they are to be considered; and land and trade are to be made subservient to each other, so far as is consistent with the good of the whole.

"For this reason, public granaries cannot be for the interest of England, unless the benefit, arising from them to trade, were of more consequence to the public, than the loss occasioned by them, in sinking the value of land: which does not appear in the present case. But the bounty is advantageous to land, and to trade also, as may be seen from the following observations.

"England was not considerable in foreign trade and shipping, till about 1600; nor had made great progress in husbandry. For money was then at ten per cent. and the current price of land was twelve years purchase. In these circumstances, no great improvements would be made: when those, who had money, could make ten per cent. of it without that trouble. The shipping was, also, very low at that time: for, by an account taken in 1582, by order of the lord high-admiral, there were then only two hundred and seventeen ships and vessels, above eighty tons, belonging to England: and about thirty years after this, not above three merchant-ships, of three hundred tons, and upwards: as we are informed by Sir Josiah Child, in his Discourse of Trade.

"But, about 1660, trade had made a quick progress, interest of money was fallen to six per cent. and the value of land very much advanced; and it appears, that wheat had risen above thirteen shillings per quarter: this was the consequence of a growing trade, for that makes every thing dearer. And hence it is evident, that to make corn cheap, a further encouragement is necessary, than what arises from trade.

"Hitherto a considerable part of the trade of England had been carried on by foreign ships, and chiefly by the Dutch; and, for this reason, the Act of Navigation was made, to exclude the Dutch and others; and to encourage English shipping. At the same time, an act passed, laying a duty upon corn imported, and permitting also a free exportation of it; which, with the additional duties laid soon afterwards upon corn, and granting a bounty upon the exportation of it, laid the foundation of the improvements in husbandry, that have been made since.

"The trade of England is now much greater than it was in 1660: and though it has been interrupted by war, and other accidents; yet, if upon the whole, it has increased in the last hundred years, as much as it did in the former sixty, the price of corn would have advanced in proportion, as in fact the prices of other things have done: and in that case, the mean price of wheat in 1662, would have been nearly sixty-nine shillings per quarter, whereas it was really less than thirty-nine shillings: and, therefore, this difference of thirty shillings per quarter, is clear profit to the public upon wheat; and a profit in proportion, upon all the corn produced in England. This is an important fact in the present argument; nor is it material whether the price of wheat is so much lower as is here stated: but it is certainly very much cheaper; and thence we may draw the following conclusions. First, that public granaries are unnecessary: for the end, that was proposed by them, is attained by the bounty. Secondly, the bounty does not make wheat dearer to our own people, five shillings per quarter, as has been supposed: but, on the contrary, they have it, by that means, thirty shillings per quarter cheaper. And, thirdly, this points out the reason of the demand for our corn abroad: as we can afford to sell it to foreigners forty per cent. cheaper, than we could have done, had agriculture received no other assistance, than it does from an extended commerce. All these sufficiently prove the utility of the bounty.

"But it is objected, that now we are got into the tract of improvement, the bounty may be discontinued: this might be true in a profitable trade, wherein we had no competitors; which cannot be said here: and it may be a sufficient answer to the objection, to shew the danger of such an experiment in a parallel case. "A large bounty," says Mr. Gee's Treatise upon Trade, p. 212, "was given for several years, to encourage the making of pitch and tar in America, till it came to be imported in such vast quantities, that we had not only enough for our own consumption, but even to export to our neighbours; from which great plenty, we were ready to persuade ourselves, that the business was effectually established; and thereupon neglected the continuance of the bounty: since which, the importation of these commodities from Russia, Sweden, and Norway, is re-assumed."

"Was it indeed true, what has been frequently asserted, in support of some favourite scheme, that foreigners must have corn of us, a bounty would be unnecessary, in respect to foreign trade. Thus, Sir Matthew Decker, speaking against the bounty, says, p. 54, "The pretence of encouraging tillage, by a bounty on corn, can have no weight now, since our great improvements in husbandry: much less, if we erected magazines of corn in every county, against times of scarcity. Foreigners never buy provisions till they want them, and then they must have them, whether we give bounties or no."

"If this be the case, we have got the monopoly of corn; and may set our own price upon it: but, if we only fancy so, and should act as if it were real, we shall fall into a dangerous error. The profit upon corn exported, is a matter of great consideration to England, in a national view: but it is a strange conceit, that we have the monopoly of it against all Europe, though all that we export,

export, is ſcarce ſufficient for one-third of the people in the province of Holland.

"Beſides, it is well known, that all countries produce corn, from about twenty-five or thirty, to ſixty degrees of latitude; and though we have no reaſon to complain, yet it is certain, that ſeveral other countries are more fertile than England; and that the principal reaſon, why all of them, of any conſiderable extent, do not produce corn enough for the inhabitants, is a want of induſtry: which it is the intereſt of England to encourage, by ſupplying them with cheap corn.

"Moſt of the countries in the Baltic, and Mediterranean, abound in corn; and, from thence, the Engliſh were ſupplied, before they raiſed enough of their own. It is quite unneceſſary to enlarge upon a thing ſo generally known; and, therefore, I ſhall only mention a circumſtance, reſpecting the fertility of Barbary, ſpoken of by the curious and learned Dr. Shaw, who lived twelve years in that country. The ſoil is ſo light, that a pair of ordinary oxen uſually plough an acre of it a day: "and one buſhel yields ordinarily from eight to twelve, though ſome diſtricts may perhaps yield a much greater increaſe: for it is common to ſee one grain produce ten or fifteen ſtalks." Travels, p. 137. This is a much greater increaſe, than is common in England; and with this additional advantage, in favour of that part of Africa, that the corn is in no danger of receiving damage by wet: for there is ſeldom, or never, any rain there in harveſt. But, what is ſtill more remarkable, theſe plentiful crops of corn, are conſtantly produced without any manure. "The plains of Africa," ſays our author, p. 399, "are never manured; yet the ſame fertility in the ſoil, and the like plenty and abundance, that have been recorded of their crops, for above theſe two thouſand years, continue to this day."

"If we look towards the Baltic, we ſhall not only find ſeveral large countries, that have been long noted for plenty of corn, but alſo ſome others, which may probably come in for a large ſhare of that trade; and very much ſink the general price of corn in Europe. For, I obſerve, that among other countries, where your Muſeum is circulated, Ruſſia is mentioned, where you remark, gentlemen, "that great encouragement is given to agriculture." If this is continued with ſpirit, it may have great effects, in regard to corn, and other articles of commerce.

"The great river Wolga takes its courſe for many hundred miles through the fertile parts of that vaſt empire: and captain Perry, who was employed by the late czar, in ſeveral great works, and in different parts of that country, fourteen years, did at laſt take a ſurvey of that river, in order to make a communication between it and the Nieva, that falls into the gulph of Finland, at Peterſburgh. This he found very practicable, and would have performed it, had not the ill-uſage he met with, obliged him to leave the country. The great importance of this communication, he mentions in his State of Ruſſia, p. 245. "If the Czar," ſays he, "lives to perform the communication, which it is his intention to make, for free water carriage, between the Wolga and Peterſburgh, he will then be able to bring oak and timber, with plenty of corn, to that place, at very eaſy rates: that the ſame may both pay a conſiderable duty to the czar, and turn very much to the advantage of his country, by the being exported from thence to other parts of Europe: for corn may then be loaded much cheaper there, than can be delivered, either at the ports of Riga, Dantzick, or Koningſberg; from whence, and other places in the Baltic, the Hollanders alone, load every year eight hundred or a thouſand ſail of ſhips with corn.

"The Ruſſes make the moſt part of their bread with rye, which they reckon to be the moſt ſtrengthening for men: and in many places on the Wolga, between the mouth of Shackſna and Caſan, rye is uſually ſold for the value of an Engliſh ſix-pence, or ſeven-pence per buſhel, according to Engliſh meaſure: wheat is about nine-pence per buſhel; and all other grain is there in price proportionable."

"When theſe things are duly weighed, together with the improvements in huſbandry now carrying on in many neighbouring countries; there is great reaſon to expect, that the general price of corn in Europe, will be lower than it has hitherto been; and of courſe a leſs demand for it from England: which will check the progreſs of Engliſh agriculture; and hence the neceſſity of a public encouragement to tillage and exportation, and of introducing new methods and improvements. It is to thoſe already made, in conſequence of the bounty, that the farmers have hitherto been enabled to continue raiſing ſtill larger quantities of corn, though the price has been ſinking upon them for one hundred years; and though during that time, the price of labour, and of the neceſſaries of life, have been advancing; as alſo the rent of land, taxes, and coſt of implements of huſbandry.

"Though I am of opinion, that public granaries would be very prejudicial in England, I would not be underſtood to mean, that no proviſion ſhould be made againſt times of ſcarcity. On the contrary, I think this highly neceſſary: but that ſuch proviſions ſhould be in the hands of private perſons; and more eſpecially, of the growers of corn: and this for ſeveral obvious reaſons; but chiefly, becauſe the poor are thus ſupplied at firſt hand; and, therefore, in the cheapeſt manner. Likewiſe, as this is the moſt certain way, to prevent engroſſing, in every degree hurtful to the public. For, of the ſeveral cauſes, that have been aſſigned of the high price of corn, there is none, in my opinion, ſo groundleſs, as that of its being engroſſed by the farmers. That ſuch a great number of perſons, of ſmall capitals, diſperſed over the whole kingdom, who have no foreign correſpondence, and very little at home further than their own neighbourhood; that theſe perſons, ſo circumſtanced, can combine together, to raiſe or keep up the price of corn, is altogether incredible; and contrary to every idea of engroſſing.

"By keeping wheat in ricks, the farmers loſe the immediate benefit of the ſtraw: and the corn is liable to be damaged, by vermin, and otherwiſe. Sometimes they have not convenient room to houſe, and threſh their wheat, when the market is riſing; and, at other times, they muſt pay an advanced price for threſhing it. Theſe inconveniencies might be avoided, if they had granaries to lodge it ſafely; and it would then be ready for market, upon the ſhorteſt notice. The granaries, contrived by M. Duhamel, are, in my opinion, by much the cheapeſt and beſt hitherto propoſed; and very convenient for the uſe of farmers, or others, who might incline to lay up ſome corn upon ſpeculation; eſpecially if made of plank, and ſo conſtructed, that they could be eaſily taken to pieces, and carried from one place to another, where the owner might think proper to ſet them up again: and probably they might be contrived ſo as to be made larger or ſmaller occaſionally.

"But, whatever methods may be thought of, to preſerve corn, in a cheaper or more compendious manner than has been commonly practiſed, they will not invalidate the objections to public granaries, as they lie againſt the whole ſcheme, for other and the ſtrongeſt reaſons, beſides the expence. And, as it is of great importance to the community, that there ſhould be corn in private hands, and in all parts of the kingdom, againſt times of ſcarcity, it is, I apprehend, a matter worthy of the conſideration of the London Society, by what means the farmers and others may be encouraged and enabled, to preſerve corn in a cheap and ſafe manner." *Muſeum Ruſticum, vol.* VI. *pag.* 404.

WHEE, *or* WHEY, a heifer.

WHINS, the ſame with furze. *See the article* FURZE.

WHISKET, a baſket.

WHITE-CLOVER, a well known plant, and reckoned the ſweeteſt feed of any of the ſown graſſes; and it is of moſt advantage to the farmer, becauſe it is perennial, or laſts a great number of years on the land.

This plant ſends forth roots at every joint, ſo that it thickens, and ſoon makes a thick ſward. When land is to be laid down for paſture, the farmer will reap great profit, if, with about four buſhels of clean-ſifted hay-ſeed to an acre, he ſows eight pounds of this clover; but it is to be remarked, that it is never to be ſown with corn.

It may be ſown either in ſpring or autumn; if in ſpring, it may be cut about the latter end of July; if ſown in autumn;

tumn; the crop will be much earlier. As ſoon as ever the hay is off the land, it ſhould be rolled with a heavy roller. In laying down land with theſe graſſes, it will be proper for the farmer to be very careful that he cleans the land of all ſorts of weeds; and the hay-ſeeds are to be ſown firſt, immediately after which the clover is to be regularly ſcattered. After ſowing, the land ſhould be lightly harrowed, with a ſhort tined harrow, to bury the ſeed; and a few days afterwards, if the weather is dry, it ſhould be rolled, to break the clods, and cloſen it.

It will be good huſbandry, if, after the plants are come up, the farmer ſhould ſend in ſome weeders, to pull up all the tall rampant weeds which might injure the crop, for, if they are ſuffered to ſeed, they will ſoon ſtock the land.

It will be proper to take the advantage of dry weather, and roll the land three or four times, after the plants have attained ſome ſize; for the clover, as is already obſerved, taking root at every joint, the ſward will thereby be greatly thickened.

If a farmer knows his own intereſt, he will ſow ſome of this white clover-ſeed by itſelf, in order to ſupply himſelf with what ſeed he may want, for it is ſometimes very dear. The beſt ſeaſon for ſowing is autumn, upon dry lands, about the beginning or middle of September; but in open, cold lands, much expoſed, a month ſooner is better: all the caution required in this autumnal ſowing is to let the land be very well rolled in the month of October, before the froſts come on, and again in March.

WHITE-SCOUR, a diſeaſe with which ſheep are too often affected, and by which great numbers of them die.

The following medicine has been often given with ſucceſs, provided the ſheep are at the ſame time removed into a dry paſture.

> Take a pint of old verjuice, half a pound of common or bay ſalt, dried well before the fire, pounded, and ſifted through a ſieve. Then mix the verjuice with the ſalt by degrees; and add half a pint of common gin, and bottle it up for uſe. When any of your ſheep are ſeized with this diſorder ſeparate them from the flock, and give each of them three large table ſpoonfuls of the mixture for a doſe, repeating it two days after, if they are not better.

WHITE-LANDS, chalky lands.

WILDS, a term uſed by our farmers to expreſs that part of a plough by which the whole is drawn forwards.

WILDERNESS, a kind of grove of large trees, in a ſpacious garden, in which the walks are made either to interſect each other in angles, or have the appearance of meanders and labyrinths.

Wilderneſſes, ſays Mr. Miller, ſhould always be proportioned to the extent of the gardens in which they are made; for it is very ridiculous to ſee a large wilderneſs planted with tall trees, in a ſmall ſpot of ground; and, on the other hand, nothing can be more abſurd, than to ſee little paultry ſquares, or quarters of wilderneſs work, in a magnificent large garden. As to the ſituation of wilderneſſes, they ſhould never be placed too near the habitation, nor ſo as to obſtruct any diſtant proſpect of the country; there being nothing ſo agreeable as an unconfined proſpect; but where from the ſituation of the place, the ſight is confined within the limits of the garden, nothing can ſo agreeably terminate the proſpect, as a beautiful ſcene of the various kinds of trees judiciouſly planted; and if it is ſo contrived, that the termination is planted circularly, with the concave towards the ſight, it will have a much better effect, than if it end in ſtrait lines or angles. The plants ſhould always be adapted to the ſize of the plantation; for it is very abſurd for tall trees to be planted in the ſmall ſquares of a little garden; and in large deſigns ſmall ſhrubs will have a mean appearance. It ſhould alſo be obſerved, never to plant ever-greens amongſt deciduous trees; but always to place the ever-greens in a wilderneſs in a ſeparate part by themſelves, and that chiefly in ſight.

As to the walks, thoſe that have the appearance of meanders, where the eye cannot diſcover more than twenty or thirty yards in length, are generally preferable to all others, and theſe ſhould now and then lead into an open circular piece of graſs; in the center of which may be placed either an obeliſk, ſtatue, or fountain; and, if in the middle of the wilderneſs there be contrived a large opening, in the center of which may be erected a dome or banquetting-houſe, ſurrounded with a green plot of graſs, it will be a conſiderable addition to the beauty of the whole. From the ſides of the walks and openings, the trees ſhould riſe gradually one above another to the middle of the quarters, where ſhould always be planted the largeſt growing trees, ſo that the heads of all the trees may appear to view, while their ſtems will be hid from the ſight. Thus in thoſe parts which are planted with deciduous trees, roſes, honey-ſuckles, ſpiræa frutex, and other kinds of low flowering ſhrubs, may be planted next the walks and openings; and at their feet, near the ſides of the walks, may be planted primroſes, violets, daffodils, &c. not in a ſtrait line, but ſo as to appear accidental, as in a natural wood. Behind the firſt row of ſhrubs ſhould be planted ſyringas, althæ frutex, mezereons, and other flowering ſhrubs of a middle growth: and theſe may be backed with many other ſorts of trees, riſing gradually to the middle of the quarters.

The part planted with ever-greens, may be diſpoſed in the following manner, viz. in the firſt line next the great walks, may be placed the laurus-tinus, boxes, ſpurge-laurel, juniper, ſavin, and other dwarf ever-greens. Behind theſe may be placed laurels, hollies, arbutuſes, and other ever-greens of a larger growth. Next to theſe may be planted alaternuſes, phyllireas, yews, cypreſſes, Virginian cedars, and other trees of the ſame growth; behind theſe may be planted Norway and ſilver firs, the true pine, and other ſorts of the fir growth; and in the middle ſhould be planted Scotch pines, pinaſter, and other of the larger growing ever-greens, which will afford a moſt delightful proſpect, if the different ſhades of the greens are curiouſly intermixed.

But beſide the grand walks and openings (which ſhould always be laid with turf, and kept well mowed) there ſhould be ſome ſmaller ſerpentine walks through the middle of the quarters, where perſons may retire for privacy; and by the ſides of theſe private walks may alſo be ſcattered ſome wood flowers and plants, which, if artfully planted, will have a very good effect.

In the general deſign for theſe wilderneſſes, there ſhould not be a ſtudied and ſtiff correſpondency between the ſeveral parts; for the greater diverſity there is in the diſtribution of theſe, the more pleaſure they will afford.

WILLOW, the name of a well known tree, of which there are ſeveral ſpecies, ſome of which may be propagated to great advantage, particularly that known by the name of the Norfolk willow, as demonſtrated by the late Mr. North, in an Appendix to a little Treatiſe on Graſſes, publiſhed by him ſome years ago. As this pamphlet may have reached the hands of but few of our readers, and will, now the author is dead, be ſcarcely ever republiſhed; we were perſuaded it merited a place in our work, eſpecially as it may ſerve as an example of a profitable method of cultivating trees of this kind, that may be applied to ſeveral others, alſo obſerving a due regard to the difference of circumſtances.

Directions for propagating the ſound-growing Norfolk willow.

"This willow (I dare affirm) will prove very profitable to the planter, and of great utility to the kingdom in general. It will grow taller and larger in twenty or thirty years, than moſt other ſorts of trees will in ſixty or ſeventy. It grows very kindly, and great quantities may be propagated at a ſmall expence. A very conſiderable profit from it will come to the planter in five or ſix years after planting: in eight or ten years more another profit will ariſe much larger than the firſt; and at laſt, which will be in about twenty or thirty years after planting, the profit will be ſurpriſing, as I will make it appear in the ſubſequent account.

"In order to begin with this willow-plantation, the land muſt be ſecurely fenced from all kinds of cattle, and muſt be well ploughed or dug in winter, to make the ſurface looſe, and to kill the graſs and weeds. The ſeaſon for planting is from November to April, and ſometimes later. The dryeſt land ſhould be planted firſt.

"One year's ſhoots are beſt for ſets when they are deſigned to make large trees. The ſets ſhould be cut to eighteen or twenty inches long; about eight or nine inches

of

of the thick or lower ends must be thrust into the ground. A strong shoot of one year's growth will frequently make three or four good sets, but I would not advise cutting any sets from the very tops of the rods, because they will be too weak to make strong shoots the first year.

"The proper distance these sets should be planted, is about three feet promiscuously. An acre will require about five thousand. In June, after planting, the sets should be all looked carefully over; and such, as have more than one shoot, should be reduced to one, and it should be minded, to leave the uppermost and strongest. The superfluous shoots should be cut off close to the set, that the bark may sooner cover the wound.

"At the same time the ground should be hoed over to kill the weeds, and to loosen the surface, in order to sow turneps, which will no ways hurt the sets, but rather be of service, provided they are properly hoed, and set out at good distances, and not suffered to grow within a foot of the sets. The winter following, when the turneps are gone, the ground should be dug all over, and, the summer after, the weeds cut down with hooks; which is the last, and all the labour of cleaning they will ever want. The best instrument to dig these plantations with, is the sort of broad-trined fork they use in Kent to dig their hop grounds. The price, by the acre, is twelve shillings for once digging.

"When these sets have grown four or five years, about three-fourths of them must be dug up, in order to leave space for the others to thrive. If they have throve well, in five years they will be above a foot in circumference, and twenty or thirty feet high. These young trees will be very proper for many uses, as for chair-makers, hoops, gates, hop-poles, &c. and will surely be worth three-pence a piece, upon an average.

"From five thousand sets which are planted upon an acre, at about three feet apart, certainly three thousand may be very properly taken away, and the remaining ones will not be left quite six feet apart. If these young trees are valued at but three-pence a piece, they will be worth thirty-seven pounds, but I rather believe, they will be worth more. Eight or ten years after the first thinning, three parts in four should again be took up, which will be about one thousand five hundred; and five hundred or more will be left at about twelve feet apart, which should grow twelve or fifteen years longer, when they will be in fine maturity. The second thinning will be of much more value than the first; upon an average, no doubt but they will be worth half a crown a tree at least, as they will be tall and large, and may be put to divers uses. Many of them will be very proper for masts for small vessels, as the wood is light and tough.

"In twelve or fifteen years more, the remaining five hundred trees will be very tall and large, perhaps above sixty feet high, and five or six feet in circumference. The least value one may conceive must be twenty shilling a tree; so that, at the lowest profit one can set upon the produce of an acre of land, planted with this noble willow, in about thirty years at most, it will be worth six hundred pounds, and all the rent, &c. paid at the rate of twenty shillings a year. I really think I have allowed too low prices for the growth, and that it is very probable they will be worth more. The wood of this tree is very white and tough, and without pith or sap; so must be very proper for carvers, turners, &c. Boards of this wood are as good for floors, or wainscoting common rooms, as any other. I am told, by a man of great veracity and judgment, that posts of this wood, set in the ground, will outlast all other sorts, except yew, or heart of oak. He also affirms, that there is no tree upon the earth so proper for ships masts as this, as it is light and tough, and will not splinter, as fir does.

"This tree has oblong, pointed, saw-edged leaves, of a most refreshing light green: at the bottom of each footstalk grow two small wings, which almost environ the young shoots.

"This willow will thrive upon almost any soil, so it be not too dry.

"It is also the best kind to plant, in large sets, by the sides of rills, &c. where they will produce larger lopping, and in less time than any other sort of willow will do.

"If any gentlemen, &c. have a mind to make plantations of this profitable tree, it would be well worth their while to lay out the ground in some gentle meander-walks; which will be but little extraordinary expence, and, in few years, will give both shade and shelter.

"This willow will make the most profitable coppice woods, to cut every six or eight years, for hop poles, and many other very useful purposes.

"They should at first be planted about two feet and a half a part; and, after five or six years, three parts in four should be dug up, and the remainder cut down within six or eight inches of the ground, to remain for stubs.

"This is also one of the best sorts of willow for basket-makers, as it grows freely, and is very tough.

"In many countries, where firing is scarce, this willow would turn to great advantage, merely for fuel; as it will grow into large billets, in three or four years, and will burn very well both green and dry.

"Since I wrote this, a gentleman told me, that he knew of three willow-trees being sold for fifteen pounds, but he could not inform me what kind they were; I fancy them to be the bright swallow-tail willow; for, next to the Norfolk kind, it is the largest growing sort; and best for most uses."

Mr. North calls this the Norfolk willow; but that is only a local name for this tree. It is by some called the Hertfordshire willow, and has had various other names in different places. The description he has given of the leaves, and the firm sound texture of the wood, without pith or sap, will, however, sufficiently ascertain the species to those who may not before know it. When he published this account, he advertised, that he would furnish sets to any who might want them. As he is very lately dead, who may be his successors in his business, or whether they will continue to provide for the demand of sets, we are at present ignorant. But it would be a matter of regret, that the difficulty of procuring them, should be any discouragement to those who may be disposed to make plantations of this tree.

There is an addition, which might be made to Mr. North's plan of deriving an intermediate profit from a plantation of these trees, while the principal of them are growing to due maturity. It is this, to leave at the second thinning one tree in the middle of every four, that are intended to grow to maturity; which middle tree will consequently be at more than six feet distance from any other, being in the diagonal line of the four. The trees so left should be then cut down, within six or eight inches of the ground, and suffered to shoot afterwards as stubs or pollards. In which state they will afford hop-poles, billets, twigs, for basket-work, &c. if cut at proper periods, from seven years to every other year, respectively to the purposes, for which the shoots may be wanted. This kind of plantation, of pollards, with tall trees, is not so proper in a drier, as in a moist situation; because the crouding the roots may, in dry seasons, injure the growth of the trees intended to stand for wood, where there is a want of moisture in the ground. But in a wet soil, it will rather assist than retard them; and will be a constant source of profit during the whole continuance of the plantation.

Other trees may be treated in the same manner, allowing for the respective differences of each, with very great advantage, in swampy and marshy ground, as in the low parts of meadows, or the waste of manors; and the plantations will often prove a beauty and convenience in other respects. In such cases the twenty shillings per year, allowed for rent in Mr. North's account, may be wholly or mostly saved.

WIND-GALL, a flatulent swelling which yields to the pressure of the finger, and recovers its shape on the removal thereof: the tumor is visible to the eye, and often seated on both sides of the back sinew, above the fetlocks, on the fore-legs; but most frequently on the hind legs; though they are met with in various parts of the body, wherever membranes can be so separated, that a quantity of air and serosities may be included within their duplicatures.

When they appear near the joints and tendons, they are generally caused by strains, or bruises on the sinews, or the sheath that covers them; which by being over-stretched, have some of their fibres ruptured; whence probably may

may ouze out that fluid which is commonly found with the included air: though where these swellings shew themselves in the interstices of large muscles, which appear blown up like bladders, air alone is the chief fluid; and these may safely be opened, and treated as a common wound.

On the first appearance of wind-galls, their cure should be attempted by restringents and bandage; for which purpose let the swelling be bathed twice a day with vinegar, or verjuice alone, or let the part be fomented with a decoction of oak bark, pomegranate, and allum boiled in verjuice, binding over it, with a rowler, a woollen cloth soaked in the same. Some for this purpose use red wine lees, others curriers shavings wetted with the same, or vinegar, bracing the part up with a firm bandage.

If this method, after a proper trial, should not be found to succeed, authors have advised the swelling to be pierced with an awl, or opened with a knife; but mild blistering has in general the preference given to these methods; the including fluids being thereby drawn off, the impacted air dispersed, and the tumor gradually diminished. A little of the blistering ointment should be laid on every other day for a week, which brings on a plentiful discharge, but generally in a few days is dried up, when the horse may be put to his usual work; and the blistering ointment renewed in that manner once a month or oftener, as the horse can be spared from business, till the cure is compleated. This is the only method to prevent scars, which firing of course leaves behind, and unless skilfully executed, too often likewise a fullness on the joint, with stiffness; the mild blistering ointment, where the sublimate is left out, is the properest for this purpose. *Bartlet's Farriery, p.* 276.

WIND-ROW, the green parts, or borders of a field, dug up, in order to carry the earth on the land to mend it; so called because it is laid in rows, and exposed to the wind.

WINE, a general name given to any brisk, agreeable cordial liquor drawn from vegetable bodies, and fermented, particularly that procured from the juice of the grape. *See the article* FERMENTATION.

One and the same kind of grape proves greatly different in taste and flavour, according to the climate and exposure to the sun. In cold countries the vine, if it grows at all, never ripens its fruit; and even in France and Italy it is constantly observed, that the grapes produced on the south sides of hills are notably sweeter than those which grow on plane grounds. Among the Tockay wine-hills, there is but one which directly fronts the south, and the advantage of it's situation are not a little remarkable: from the extraordinary sweetness of its grapes, it is called the sugar-hill. It affords the most delicious of all the Hungarian wines, and is appropriated to the use of the imperial family.

In very warm dry seasons, the grapes at the bottoms of the hills are best; in warm and moist ones, those at the top; such as grow in the mid-region being always good. In dry summers, the grapes are sweetest, but least juicy: in rainy ones they abound with juice, which proves proportionably weaker and more dilute. Frosts in autumn promote their ripening; but frost succeeding heavy rains makes them apt to burst and shed their juice.

The grapes in America are remarkably apt to burst; which Mr. Miller imputes, either to the too great moisture of the air in that country, or to their receiving too much nourishment from its over rich soil. But gentlemen of America think that their air, except in marshy places, is drier than ours; and are therefore of opinion, that the bursting of their grapes is not owing to the too great moisture of the air. If it proceeds from too much nourishment, the remedy would seem to be easy, by training up a great number of branches to consume that nourishment. Others, perhaps with more reason, impute their bursting to their ripening too early, while the heavy rains, frequent in autumn, continue to fall. In this case, they may be raised against lofty trees, as was the method of the ancient Romans, and as still is the practice in many parts of Languedoc and Provence. The reflection of the heat, from the earth, would then be less, and the leaves of the trees would shelter the grapes from the sun. By this means, being later before they fill, they would not be so apt to burst; and as the latter end of the autumn is generally fair, they may then have an opportunity of coming to their full maturity, without the danger of bursting. Or if it be thought more advisable to quicken their ripening, the warmest soil and situation should be chosen for the vines, and they should be kept low.

A due degree of maturity is essentially necessary in every kind of fruit, the juice of which is to be made into wine; because the juice of unripe fruit is a rough acid liquor, which cannot be made to undergo a vinous fermentation, without great difficulty. In some instances, as in verjuice, it will remain in the same state for years together. Nor is there less danger from the fruit's being over ripe; because the least taint or putrefaction will, as before observed, run through the whole process of the wine, in spite of every art that can be used to correct or remove it.

When a considerable portion of the grapes have attained their full maturity, these should be gathered with great skill and care; leaving the unripe for a future gathering. Most vintagers make it an almost general rule, to gather their grapes at a certain stated time, according to the custom of the country, without attending to their various degrees of ripeness; therein imitating other rustics, who seldom vary their operations as the seasons vary. Thus, in some countries they make it a general rule to gather their grapes when dry; and in others they as carefully gather them when they are wet with dew. In both, the circumstances of the seasons should perhaps vary this custom: for example, when a warm kindly season has brought the grapes to a due maturity, such juice wants no addition; and if, on the other hand, the dryness of the season should have thickened their juice too much, the dew may remedy that defect. If a cold or rainy season has prevented their ripening thoroughly, and they still continue in an acid watery state, surely the warmest and driest hours should be chosen for gathering them.

In some places, the grape is concentrated or rendered richer, by suffering it to remain on the tree till great part of its watery moisture has exhaled; the stem of each cluster being cut half through, when the fruit is ripe, to prevent the afflux of any fresh juice, from the plant. The sweet Hungarian and Spanish wines are made from grapes that have been thus half dried.

In order to make good wine, the grapes of the same vine should be gathered at three different times. The first gathering should consist of the ripest, finest and most open bunches. They should be cut as close as possible to the fruit, the better to avoid the austere sharpness and bitterness of the stalk, and all their rotten or green berries be carefully picked off, or rather cut off with a pair of sharp scissars. Some are even so nice as to cut off the grapes at the end of the bunches, because they are always weaker in quality, as well as less ripe, than those which grow higher up on the stalk. By this means, they indeed diminish the quantity of their wine; but what they do make, is thereby vastly improved. An inferior wine is, however, made of the grapes that are so cut off. This practice is, indeed, attended with some trouble; but it answers extremely well, and deserves to be much recommended, as a means of obtaining at least some good wine, in years when, and places where, the grapes do not ripen perfectly. The second gathering should be of the large, close, and less ripe bunches; for close bunches never ripen thoroughly: and the third will of course consist of the refuse of the former gatherings; but no rotten grapes should ever be mixed with either. Each of these three cuttings should be pressed separately. It is highly necessary always to employ a sufficient number of gatherers, each of which should be provided with a basket and knife, and should lay the bunches, as fast as they are cut, gently in the baskets, without bruising or squeezing them: for the more expeditiously they are gathered, the finer will be the colour of the wine; and the sooner they are pressed the better will be its quality. Women are most commonly employed for gathering the grapes, because their labour is cheaper than that of men, and this does not require any great exertion of strength.

This first work, which is of the utmost importance to the making of good wine, may be still more completely performed by duly attending to the following circumstance. The fruits of different vineyards are of different qualities: some,

ſome, ſituated on very light and ſtony land, yield exceedingly delicate and high flavoured wine, which ſeldom is ſtrong; whilſt the grapes of vines growing on a richer ſoil, where they receive more nouriſhment, afford a wine which has more body. Both theſe good qualities may be united in the ſame wine, either by mixing the grapes of the different growths before they are preſſed, or by mixing the different wines that have been obtained from them: but the ſureſt way is to mix the grapes, becauſe it is thought that theſe liquors do not eaſily incorporate perfectly after they are made: the weakeſt of them is ſaid to change its colour, and to communicate its defects to the other, inſtead of being mended by the ſuperior quality of that with which it is blended: ſo that, according to many who pretend to have had long experience in theſe matters, the leaſt evil, and that leaſt is a very great one, which can ariſe from thence, is a cloudineſs in the liquor, a ſort of floating lees which will always tarniſh the beauty of its colour, ſpoil the perfection of its taſte, and prevent its ever becoming perfectly bright. This does not happen when the perfect grapes of one vineyard are mixed with the perfect grapes of another: for, from the juices of theſe different fruits preſſed out and fermented together, proceeds an exquiſite, ſound, delicate, fragant, and bright coloured liquor, which will keep ſeveral years without the leaſt alteration. It is by a knowledge of the good effects produced by a judicious mixture of the grapes of three or four vineyards of different qualities, that the celebrated Champagne wines of Silleri, Aï, and Hautvilliers, have been brought to the perfection for which they are ſo famed. Every thing that can delight the palate ſeems to be united in them. But this knowledge can be acquired only by many repeated trials and long experience.

One of the ways of making wine in the higheſt perfection of which it is ſuſceptible, is to ſtrip the grapes from off their ſtalks before they are thrown into the vat. By this means all the auſtere roughneſs which the ſtalks would communicate to the liquor is guarded againſt, and the muſt may be ſuffered to ferment, without danger, till the fermentation has ſufficiently opened the body of the fruit. The wine which is thus obtained is the melloweſt, beſt coloured, ſoundeſt, and fitteſt for keeping.

The above directions for gathering and ſorting the grapes are equally proper, whether white wine is to be made, or red; for either of theſe differently coloured wines may be, and generally is, obtained from the ſame grapes, that is to ſay, from black ones. As to the white wine which white grapes yield, it ſeldom has much ſtrength or flavour, ſoon grows yellow, and, for want of body, rarely keeps well even till the next ſummer. All the white wines of Champagne, which look as bright and as clear as cryſtal, are made from the blackeſt grapes, and never preſerve their colour better than when all the plants of white grapes have been rooted out of the vineyard. Formerly, the wine of Aï would hardly keep a year; the thin ſweet juice of the white grapes, of which the quantity was great in the vineyards of that diſtrict, turning yellow, gained the aſcendant, and altered the whole maſs of the wine. But ſince white grapes have been no longer uſed in the white Champagne wines, that of the mountain of Reims laſts ſeven or eight years, and that of the river Marne keeps well for four or five.

The wine of black grapes may be made of almoſt any depth of colour that one pleaſes. They who deſire to have it perfectly white, proceed thus. The gatherers go into the vineyard very early in the morning, and ſelect the fineſt bunches, which they cut as cloſe as poſſible to the fruit, then lay them gently in their ſmall hand baſkets, and when theſe begin to be full, put them, ſtill as gently as can be, into panniers, commonly called dorſers, in which men or women carry them, with the greateſt care not to tumble or bruiſe them in the leaſt, to the end of the vineyard, where they are put carefully into large panniers, with all their bloom, or azure, as it is technically termed, and all the dew upon them. This dew increaſes greatly the quantity of the wine; but at the ſame time it weakens it conſiderably.

If the ſun begins to be a little powerful, the vintagers ſpread wet cloths over the baſkets, whether dorſers or panniers; becauſe, if the grapes ſhould be heated, the liquor drawn from them would be apt to contract a reddiſh teint. If the place where they are to be preſſed is not far from the vineyard, men or women carry the dorſers gently on their backs to the preſs; but if the diſtance is conſiderable, the panniers, into which the grapes are in that caſe put, are loaded upon quiet eaſy going beaſts, which carry them ſlowly, and without ſhaking, to the cellar, where they remain covered and cool. When the heat of the ſun is but moderate, the vintagers continue their work ſafely till eleven o'clock: but when it ſhines ſtrongly, they leave off at nine.

For the making of white wine, of which we now ſpeak, the grapes are thrown, as faſt as the panniers arrive with them, not into the vat, as would be done for red wine, but into the preſs, of whatever form it be, and the firſt preſſing is given immediately. The wine which runs from this preſſing is the moſt delicate of any. The French call it *vin de goutte*, becauſe it rather drops than runs, as but little force is uſed in preſſing it. After this firſt preſſing, which is but gentle, for fear of diſcolouring the liquor, the preſs is raiſed, the ſcattered grapes are thrown up upon the cake, and the ſecond preſſing, called the turning up *(la retrouſſe)* is given. Here the preſs is ſcrewed down with much greater force than before, and if this ſecond running is not quite ſo plentiful as the firſt, though it ſometimes is more ſo, it is at leaſt but little inferior to it in flavour or colour, and preferable in this, that it has a ſtronger body, and will keep a conſiderably longer time. The wine of the firſt preſſing is, however, always ſet apart, if it has been drawn from quite ripe grapes and in very warm weather; becauſe the juice of the fruit then runs very plentifully, and there might be danger of reddening it by mixing it with that of the ſecond preſſing: but this mixing of them is uſeful, and ſometimes neceſſary, on account of the greater ſtrength of the ſecond running when the year is not a warm one, and when the firſt preſſing has not yielded plentifully.

After the two firſt preſſings, the ſides of the cake of grapes are cut down perpendicularly, with a ſteel ſpade, ſo far as they exceed the breadth of the upper part of the preſs which is let down upon the fruit; the grapes thereby ſeparated are thrown up on the top of the cake; and the third preſſing, commonly called the firſt cutting, is given. The juices of this firſt cutting are excellent, to make a perfect liquor; and they may alſo be added to the red wine, if any of this is made ſeparately. A fourth preſſing, a fifth, and ſo on of others, which are called the ſecond, third, and fourth cutting, are given after this; the ſides of the cake being cut down and thrown up each time, till the grapes ceaſe to yield any more juice. The liquor of the cuttings becomes gradually more and more red, becauſe the action of the preſs becomes more and more forcible upon the thin ſkin which envelops the berry, and the particles detached from thence are what render the wine red. Sometimes too the heat of the ſun, or the ſhaking of the fruit in the carriage, are ſo great, and act ſo powerfully upon the outſide of the grapes, that the tinging particles which are in the ſkin of the berries, being let looſe, mix immediately with the juice of the grape at the very firſt preſſing, and then a perfectly white wine cannot be made; but it will be of the colour of a partrige's eye, or even deeper. The wine itſelf is not, in fact, at all the worſe for this: but the faſhion is to have it either perfectly white, or of a full bright red.

The wines of theſe different cuttings (as the latter preſſings are called) are collected ſeparately, and afterwards mixed according as they contain more or leſs of the quality that is wanted. Thoſe who have many grapes preſs them at two, three, or even four different times, and collect each of the runnings ſeparately. For the firſt they conſtantly chooſe the moſt perfect grapes, and this wine is always worth a third part more than the ſecond, and ſo on in proportion.

It is eſſential to obſerve that the preſſings for white wine, if it be wiſhed to have it very pale, ſhould be performed as quick as poſſible one after the other, in order that the grapes may not have time to heat, nor the liquor remain long upon the murk. Particular attention ſhould be paid to this for the two firſt runnings, becauſe they yield the fineſt wine.

Of the ſame black grapes, namely the black morillons, the pineaus, and the Auvernats, with which we have ſeen that

that white wine is made in Champagne, red wine is made in Burgundy; and indeed the same has, of late years, been attempted also in Champagne, with no bad success; though not so as by any means to equal the fine white wines of that country, or the best red wines of Burgundy.

As much as the heat of the sun is avoided by the vintagers who make white wine, so much it is sought after and wished for by those who make red wine. These always choose to gather their grapes when the sun shines hottest; because they find that its action upon the outside of the berries produces more effect than several days steeping in the vat would do; for that the grapes then ferment very speedily. As to the rest, the cautions before directed for gathering the grapes for white wine, in regard to their ripeness, the sorting of them, cutting the bunches off with as short stalks as possible, clearing them of all damaged, rotten, and unripe berries, &c. should be equally observed here. Some express the juice of these grapes in the open air, either in the vineyard itself, or close to it, by throwing the bunches into large tubs, and there mashing or bruising them to pieces, with sticks, or by putting children into the tubs to tread out their juice. Others carry them home, with care not to bruise them by the way, and put them in a vat, in which they are trodden and mashed. This, in either of these cases, is repeated till the vessel is full; and after that the broken grapes are let lie in their liquor more or less time, according to the heat of the weather, the flavour of the must, and the degree of colour that is intended to be given to the wine. During this time, the whole must be frequently stirred together, the better to raise a fermentation, and tinge the liquor with a due degree of red; for it is known by experience, that the redness of wine proceeds from the more or less intimate mixture of the colouring which is in the skin of the grape, with the juice which is contained in the pulpy body of the berry. It is, in fact, chiefly to give this dye to the wine, that the trodden grapes are let lie to ferment in the tub or vat before they are pressed.

Some advise, as a general rule for all red wines, to let the grapes lie in their liquor forty-eight hours; whilst others, going on in the beaten track of their forefathers, without daring even to suspect that there may possibly be errors in the stated practice of their country, talk of letting the grapes infuse during seven or eight days, or even longer, and act accordingly: but the authors of the Maisons Rustique, who seem to have taken their directions from more judicious and more accurate observations, say positively, that the duration of this infusion of the husks should be proportioned, not only to the heat of the weather, but also to the natural quality of the grapes, and to the usual, or intended colour of the wine that is to be made. Thus, for the Coulange wine, which is one of the most esteemed growths of Burgundy, only four hours, or at most five, are allowed for the steeping of the husks, unless the weather be chilly and rainy, in which case they are sometimes suffered to remain all night in the liquor. This is likewise, now, the practice of the best vintagers throughout the whole province of Burgundy, in most parts of that of Orleans, and, in short, in almost every part of France where the finest, highest flavoured, and most spirituous red wines are made: and the reasons for it are, that this time is found to be sufficient to give the wine a duly deep colour; that it is apt to contract a roughness from the stalks if it remains too long upon them (to guard against which, as much as can be, care is taken to pull the stalks out with the rake, or stick, with which the must is stirred in the tubs or vat, whilst others, more cautious, pick the grapes from off them before it is trodden out); and also, because too much fermenting of the must always renders the wine harsh and coarse, deprives it of its most volatile parts, and the quantity of the must is considerably diminished by the loss of what flies off, or is otherwise wasted in the fermentation. Others again make it a rule not to draw off their must till its head begins to fall. But in this they are evidently wrong; because a great part of the most active spirits of the liquor is certainly evaporated thereby. It may indeed be true, and probably is, that the liquor which has lain long upon the murk acquires the most strength, and is therefore fittest for keeping: but at the same time it also acquires a roughness and bitterness of taste, communicated from the stones and stalks of the grapes, which are far from rendering it the more palatable.

Might not the surest way of judging when the liquor has lain a sufficient time upon the bruised grapes be, to thrust one's hand pretty deep into the vat, to take from thence a handful of the murk, and to smell to it, as the dyers do, to judge of the disposition of their vats? One might then, perhaps, especially with the help of some experience, know pretty exactly whether the liquor be sufficiently concocted, and whether it has acquired colour enough. If it smells sweet, it should be let work a little longer in the vat; at least till it has lost that smell, and has acquired so strong a scent as to affect the nose. Then may probably be the right time for drawing it off. A good bodied wine will never taste of the grape stone, if it be taken in its proper degree of the vat; but it will keep sound for many years, and be always fit to drink.

To the different ways of managing the must is certainly owing, in a great measure at least, that some people make much better wine than others from grapes of the very same sort, of equal ripeness, and of the growth of equally good and well situated vineyards. Indeed, for thicker, heavier, and coarser wines, than those of either Burgundy or Orleans, of which, chiefly, we have now been speaking; such, for example, as the Bourdeaux claret, of which we are so fond in this country, and of which the French themselves do not drink any at home, a whole day is frequently allowed for the steeping of the husks, and sometimes more, before the press is recurred to. But as to the rule of letting the grapes lie to steep in their liquor forty-eight hours, and much less the longer time which some recommend and practice; we cannot, for the above reasons, think it properly applicable to any sort of wine, unless it may, perhaps, be in very cold unfavourable weather, or for such thick, heavy, dark coloured, and very heady wines, as those of Oporto, which, as is well known, are scarcely drinkable even here, till age has depurated them and softened their natural roughness. It is true, that wine which has fermented long upon the murk may always be best for keeping; but it will never be the most pleasing to drink.

We consequently do not approve of this part of the method of making red wine in Chianti, from whence we may probably judge of the general practice in Italy. When the grapes there are of a due ripeness, and the weather warm and dry, they are cut as soon as the sun or wind has dried up the dew that was on them, and are put into little barrels, commonly called piggins, in which they are carried to the wine vat, on mules if it be distant, but between two men if it be near. They are then bruised to mash in those barrels with a club, and thrown directly into the vat, or else into a kind of very large hopper placed over the vat, with a grate lengthwise, through which the juice, husks, stones, and stalks all pass into the vat, upon their being trodden; and this is continued till the vat is full; when immediately, or sometimes even hours before it is full, the must thus made ferments. By this means the husks, stalks, and stones are thrown up to the top of the liquor, where they form a thick crust; and this ebullition, which will continue for many days if the liquor be strong, for its duration depends on the strength of the must as well as on the temperature of the air, is suffered to proceed till the wine is judged to be fit for drawing off. This fitness is determined by the palate; and herein consists the greatest skill in the art of making wine. Old practitioners know precisely, by the colour, smell, and taste of the must, the exact time that best suits their method of proceeding: but it cannot be learnt without great attention, and long experience. The wines of the plains are generally deemed ready for tunning in about ten days, those of the hills in about fifteen, and those of the mountains in Chianti in about eighteen or twenty, or sometimes more; for in this way of proceeding, the weather has always a very great influence on the ripening of the must. When it is judged to be near ready for tunning, those who are skilled in those matters taste it every eight hours. The longer the ebullition is continued, the drier and deeper coloured will the wine be; and the less it is continued, the sweeter and paler will be the liquor.

The vats are proportioned to the quantity of wine that is to be made at one preffing, and there frequently are feveral of them in the fame vineyard; for the Italians prefs all their red grapes in the open air. The vats on which the hoppers are fet are covered with boards, and a coarfe linnen cloth, the better to prevent the evaporating of the wine, and other accidents.

When the Italians make their ftrong white wines, or mufcadines, they gather their grapes carefully, and lay them in the fun for three or four days, or more; always houfing them at night, or at leaft covering them then fo that no dew may fall on them. They call the ebullition which thefe undergo in the vat a fhort one, becaufe it does not exceed five or fix days; after which they tun up the wine, and fhift it twice or thrice from one cafk to another, to make it become fine. As to the Verdea or white Florence, as it is called, they draw it off from the vat almoft as foon as an ebullition begins to rife in it, and has thrown up the hufks, ftones, &c. fo as to form a cruft at top. They then let the ebullition continue for a day and a half, or at moft two days, in the cafk into which it has been drawn, from which they afterwards fhift it into another, and in a few hours more into a third and fourth, to check and prevent the fermentation. By this means it is made to retain that fweetnefs which the ladies in moft countries are fond of: but wine thus managed never is perfectly fine.

When the muft has fermented upon the hufks of the grapes in the tubs, or vats, as long as is thought proper, it is poured off from the former into other veffels, and drawn off from the latter by means of a brafs cock placed about three or four inches above the bottom of the vat, from whence it runs into a receiver, which, as well as that under the prefs, generally is a very large cafk, open at one end, and placed upright directly underneath the cock or channel through which the liquor flows. A bundle of pretty clofe-tied twigs, commonly of vine cuttings, or of the haulm of afparagus run up to feed, is placed within the vat, before the grapes are put into it to be trodden, clofe to the entrance of the cock, to prevent the hufks from running into it fo as to choak it up; and a large ftone or two is laid upon this bundle, to keep it down. Befides this precaution to retain the hufks, &c. of the grapes, and prevent their mixing with the liquor that is drawn off, fome, for greater fecurity, let their muft run from the cock through a fieve, into the receiver, from whence (as alfo from the abovementioned tubs, in the ufing of which the fame precaution of keeping back the hufks, &c. is carefully obferved when the liquor is poured out of one into another), it is laded by hand, in bowls, jugs, jets, or pails, and poured into the cafks, through pewter funnels.

After the muft has been thus poured or drawn off, the murk, that is to fay, the remainder of the grapes at the bottom of the tubs or vat, is collected together and put into the prefs, where it is fqueezed very hard, three or four times, in fhort, till it is perfectly dry, its fides being cut down each time, and thrown up, as before directed for the latter preffings of the grapes; and the liquor obtained from thence, efpecially if the prefs be fcrewed fo tight as to crack the feeds of the grapes, has a ftronger body than any of the preceding runnings, but not any part of their fine, high, or delicate flavour. Some, however, mix a little of it with their other wines, to ftrengthen them, and thereby make them keep the better: but certainly not to mend their tafte.

Others, in whom the fpirit of oeconomy is very prevalent, pour as much water as they think proper upon the murk in the vat, immediately after the muft has been drawn off. They do this immediately, for fear of the murk's turning four, as it would be very apt to do, if they fhould wait longer. They then ftir it about, and leave it upon the murk a longer or fhorter time, according to the heat of the weather, till they find it pretty highly coloured, and judge that it has incorporated all the remaining particles and fpirit of the wine. They then draw this water off into another veffel, and carry the remaining murk to the prefs, where they fqueeze it till not a drop of moifture remains in it. The liquor thus extracted is mixed with that which was drawn off before, and is then barrelled. This is principally intended for common ufe, or rather for fervants: but it muft be drank in the enfuing winter; for it will turn four by the next fummer. It is brifk and pleafant enough whilft it lafts good, and is much preferable to water cyder; though not equal to the refufe wine, as it is called, of which a vat, or more, is generally made by itfelf, of the damaged, rotten, or unripe black grapes that were left at the laft gathering, as not being fit for the finer wines.

Another ufe too which the French make of the murk of their grapes after the muft has been drawn off from the vat, is, to amend fuch of their wines, whether red or white, old or new, as are deficient in colour or ftrength. To this end, they empty them out of their cafks into the vat, immediately after the muft has been drawn off, ftir the murk up fo as to mix it thoroughly with them, and then let them remain upon it, at moft twenty-four hours if it be new-wine, and twelve hours if it be old. When they find that it has taken a fufficient degree of colour, and that it is not fweet to the tafte, but agreeable to drink, they draw it off, barrel it up feparately, in order to know it again, and then put the remaining murk in the prefs, where it is fqueezed as dry as poffible.

As to the white grapes that were rejected at the former gatherings, they are let hang upon the vines till the latter end of October or beginning of November, that they may be a little bitten by the froft. They are then gathered, and a wine is made of them which is fold quite warm from the vat, and does well enough to mix with coarfe red wine.

The newly preffed murk of grapes foon contracts a heat; and as it contains many fpirituous parts, it is then ufed as an effectual remedy for rheumatic pains, ftiffnefs of the joints, and numbnefs of the limbs. The way of applying it is, to bury the part affected under a heap of fermenting murk.

By the time that the murk has undergone the utmoft dint of preffing, it will be as hard as a ftone: but even then it will yield, when diluted with water, fermented, and diftilled, a fpirit which has its medicinal, as well as domeftic, ufes. Or it makes a good manure for land; particularly, fay fome, for vines and for afparagus.

The too great propenfity to fermentation in hot countries has laid the inhabitants of thofe parts under the neceffity of ufing means to retard it: but the method which they practice for this purpofe renders their wines, as Dr. Neumann juftly obferves, fcarcely deferving of that name; becaufe they hardly undergo any degree of fermentation at all, and are, in fact, no better than boiled muft. Several of the Italian wines are of this fort, and are called by the general name of *vino cotto*, "boiled wine." It is to thin watery juices, extremely prone to ferment, and in which fermentation, when once begun, can fcarcely be fuppreffed till it has run beyond the vinous ftate, that the procefs of boiling over a fire is applied. The fermentative quality is thereby reftrained, and the liquor becomes richer, and continues fit for drinking at leaft a year or two, though it is never fo wholfome as the fermented wines. The effects of muft and of wine upon animal bodies are diametrically oppofite: for muft relaxes and liquefies, and, if drank immoderately, is apt to produce dangerous fluxes; whereas perfect wine, on the contrary, corroborates and conftringes. This the doctor reckons the firft of three claffes into which he very properly divides wine, with refpect to its fermentation.

The fecond clafs comprehends thofe wines which have undergone fermentation, but not a complete one. Of thefe there are two kinds. The firft is the thin fweet wines; which are no other than muft partially fermented, or whofe fermentation is checked, while it can be checked, before the fweetnefs has gone off. Thefe wines can fcarcely be kept above a year. Such as the Tyrol, fome of the Savoy, and feveral of the Italian. The fecond fort is the ftrong, full-bodied, rich, fweet wines, which are generally a mixture of fermented and infpiffated muft; the latter being added to increafe the richnefs of the liquor, and prevent the fermentation from running beyond its due limits. Thefe kinds of wines greatly heat the conftitution, and ought to be very fparingly drank: fuch are Malmfey, Canary, and fome of the Spanifh and Hungarian wines.

To the third claſs belong thoſe wines which have been completely fermented, and have thrown off their groſs matter. Theſe are the moſt perfect wines, and for common uſe the moſt wholſome.

In cold countries, where, for want of the ſun's having force enough to mellow and enrich the juice of the grape, the muſt is thin and poor; ſugar, or dried grapes, ſhould be added to the muſt, to give it a body. Authors name a variety of other ingredients for this purpoſe; but they are uſeful only as they contain a ſaccharine ſubſtance. It is therefore moſt adviſable to uſe good ſugar, which requires no other care than diſſolving it in the juice in the proportion deſired, or found to be wanted. If part of the juice is evaporated by fire, as is ſometimes practiſed, a ferment muſt be added, to make up for the inaptitude to ferment, which experience has ſhewn to be in all juices that have been boiled.

When we here adviſe the adding of ſugar, in particular, we do it on a ſuppoſition of its being the ſubſtance moſt eaſily come at; and alſo becauſe it has been proved by ſome late experiments, that all juices are more or leſs fermentable in proportion to the quantity of ſaccharine matter contained in them.

If the juice is ſo ſour that it will not ferment kindly, no alkaline ſalts ſhould be recurred to, though greatly recommended by ſeveral authors; becauſe they raiſe ſo ſtrong an effervescence, that they deprive the liquor of much of its moſt volatile and active principles, and thereby leave it vapid. Inſtead of theſe, ſuch calcarious ſubſtances as will give the leaſt taſte to the liquor, or diſſolve the leaſt in it, ſhould be preferred. Such are, extremely well cleaned oyſter or other ſhells, and hard lime-ſtone or marble reduced to powder. Theſe ſhould not be calcined or burnt; becauſe they would then communicate a diſagreeable taſte to the liquor, and be beſides attended with the diſadvantage of raiſing too great an effervescence. Next to theſe, chalk bids the faireſt to anſwer the deſired end. But a caution neceſſary to be obſerved when theſe or any other ſuch like ſubſtances are uſed, is, that the too great acidity of the liquor ſhould be only leſſened; for a certain degree of acidity is eſſentially neceſſary in all wines. If the juice is otherwiſe rich in ſubſtance, and faulty only in being too acid, warmth alone has, in many inſtances, been found to be a ſufficient cure. Madeira, for example, is always harſh, till it has been mellowed by heat: and thus again, ſome gentlemen in England and America, when the juice of their grapes has not fermented kindly, have obtained a very good wine by expoſing the containing veſſels, in a warm ſituation, to the ſun, with an intention of turning it to vinegar. Chemiſts know that all vegetable acids are volatile in certain degrees of heat; and it is highly probable that the effect of this ſummer expoſure may be the evaporation of the acid, and thereby the converſion of the whole into a mild vinous fluid. Inſtances are not wanting, of the roughest verjuice being turned to a ſtrong pleaſant cider, or vinous fluid, by means of a warm ſituation accidentally given it. Habit has made a gently acid even deſirable in ſome wines, as in rheniſh.

In ſeveral parts of Germany where the grapes ſeldom come to full maturity, and are therefore gathered ſomewhat green, the makers of wine have iron ſtoves in their cellars, and keep in them a conſtant fire, at leaſt during the time of fermentation. This, by heightening the fermentation, ripens and meliorates the wines, and renders them much more palatable and agreeable than they would otherwiſe be. We have already ſeen that keeping the wines in places conſiderably warmed either by the ſun, or by fire, will have the ſame effect, even ſo late as in the ſummer after the vintage: for acid liquors remain long without either fermenting thoroughly, or putrifying.

As the wines drawn from the laſt gathering of the grapes cannot be ſo perfect as the others, for want of due maturity in the fruit, the people of Champagne and Burgundy have recourſe to the following method, to accelerate their ripening. When the wines have been about three weeks in the caſks, and have been drawn off their firſt lees, they roll them up and down for ſome time, five or ſix times a day, for four or five days running; then two or three times a day, for three or four days; and afterwards twice a day, for about four days; then once a day, for about a week; and after that, once in four or five days. If the grapes were gathered very green, the rolling in this manner is continued, in all, for about five or ſix weeks: but if they were tolerably ripe when gathered, rolling once in four or five days, for about a month or ſix weeks, is found to be ſufficient. This rolling of the liquor in the caſks is intended to ſupply the defect of its firſt fermentation.

It now appears evidently, from the foregoing account of the practice of making wines in hot and cold countries, that a means to counteract the inconveniences of the climate is wanting in each. If they had proper cellars and vaults, as before obſerved, the too quick and too great fermentation in hot countries might be reſtrained and kept within due bounds; and a proper degree of heat during the fermentation in a cold country, might give the juice that rich mellowneſs which the too weak ſun could not.

The new wines will generally ferment of themſelves, within a few days after they have been put into the caſks. Thoſe that do not ſhould be helped, by putting into them a little of the froth, or yeaſt, which works from the others. The fineſt wines will ferment the ſooneſt: and this fermentation will continue for about ten or twelve days, according to the ſort of the wine, and the ſeaſon of the year.

While the wine ferments, the bung-hole of the caſk muſt be left open, or only covered with a thin linen cloth, to prevent any dirt from falling in: and this cloth ſhould be laid hollow, ſo that the froth ariſing from the fermentation may have room to work off.

When the fermentation is pretty well over, which is known by the froth's ceaſing to riſe ſo faſt as before, the bung may be cloſed down, after filling up the caſk with liquor to within two inches of the top; and a vent-hole ſhould then be opened and left, to carry off whatever may be thrown up by any ſubſequent fermentation. This filling up of the caſk to within two inches of the vent-hole ſhould be regularly performed every two days, for about ten or twelve days running: for the fermentation will continue a conſiderable time, though in a leſs degree; and if the caſks are not kept ſo full as that the foulneſs thrown up by the fermentation may be carried off at the vent-hole, it will fall back again into the wine, and prevent its becoming clear. After filling up each caſk in this manner to within two inches of the bung, for about ten or twelve days, it muſt be filled up to within an inch every fifth or ſixth day, for the ſpace of a month; after which, once a fortnight will be ſufficient during the next three months.

Though the fermentation will be over long before this laſt mentioned time, yet the caſks muſt be filled up once a month ſo long as they remain in the cellar: for as the wine will waſte inſenſibly in them, it will grow flat and heavy, if they are not kept conſtantly filled up. It were needleſs to ſay, that the vent-holes muſt be ſtopped when the fermentation is over.

About the middle of December, the wines may be drawn off from their lees into freſh caſks, for the firſt time; taking care to fill the caſks up, and to place them ſo that they may not be ſhaken or diſturbed until the middle of February, when it will be right to draw them off again into other caſks. If the quantity of lees is then found to be ſo conſiderable as to endanger their contracting a putrid taint by remaining too long mixed with the wine, it may be adviſable to draw it off again after a proper interval of time; or ſometimes it may be neceſſary to repeat this racking even more frequently, though hardly ſo often as is practiſed in Champagne, viz. even twelve or thirteen times in the ſpace of four years; becauſe, though this may render the wine very clear, bright, and pleaſing to the eye, it muſt ſurely diminiſh its ſtrength, and conſequently make it be the leſs fit for keeping.

A leathern pipe, about ſix or ſeven inches in circumference, well ſewed with a double ſeam, to prevent the wine's running out, is, at the diſtance of every five or ſix feet, very tightly bound with ſtrong waxed twine around braſs rings of the ſame dimenſions, made to ſcrew into other rings faſtened in the ſame manner to other ſimilar pipes. The number of theſe pipes may be ſuited to whatever diſtance is found proper or neceſſary: or, when the diſtance between the caſks is always nearly the ſame, the leathern pipe may be made of one ſingle piece, with only a braſs ſcrew-ring at each of its ends. To theſe ſcrews a the extremities of the leathern pipe ſhould be fitted, ſo as to ſcrew exactly on or into them, two ſtrong braſs cocks, which are however first to be thrust as lightly as possible, by their more taper ends, the one into the usual tapping place of the cask which is to be emptied, and the other into the usual tapping place of that which is to be filled; that is to say, each of these cocks is to be firmly and closely fixed at about two or three inches above the lowest part of the head of the cask to which it is applied. It were needless to observe that these cocks must be quite strait, the better to complete the communication from one cask to the other. When every thing is thus prepared, the cocks, being duly fixed in their respective casks, are both opened, and the wine then flows naturally from the full cask into the empty one, till the liquor becomes of an equal height in each, without in the last disturbing the lees of the wine in the cask that is to be emptied. When the wine ceases to run spontaneously, the rest of it is forced out by means bellows constructed as follows.

These bellows are about three feet long, and a foot and an half broad at their widest part. They are made and shaped in the common manner to within about four inches of their smaller end, from whence the remainder of them is but three or four inches wide. In the inside of the place where their breadth is thus altered, the air passes through a hole of an inch bore; and upon this hole, on the side of it that is next the nozzle of the bellows, is a piece of leather, like the valve of a pump, so fitted that when the bellows are lifted up to take in fresh air, that valve instantly closes upon the hole, in such manner that none of the air which has passed through this hole, and entered into the cask, can be drawn back again; but the bellows take in fresh air, by their holes below.

Instead of ending with a strait nozzle like other bellows, these terminate in a tube or pipe of wood, a foot long, closely jointed into their smaller end, and there well glued and strongly fastened by good pegs, in a direction perpendicular to that of the body of the bellows, in order to its conducting the air downward. This nozzle, for such we shall now call it in compliance to custom, is round, and about nine or ten inches in circumference over its outside at the top, from whence it diminishes gradually towards its other end, the better to fit it for entering some inches in at the bung hole of the vessel, and also to close up that hole so exactly, that no air may get in, or come out, at its sides. The upper part of this nozzle rises about two inches above the level of the small end of the bellows, and is there cut somewhat flat, that it may be the more easily struck with a wooden mallet, and thereby forced the closer into the bung-hole of the cask: and also, at about two fingers breadth below the upper part of this nozzle, is nailed an iron ring, thro' which is passed an iron hook, or brace, a foot long, by means whereof the bellows are cramped down to the hoops of the cask: for without this precaution, the force of the air would drive the bellows out of the bung-hole, and the operation of emptying the broached vessel would not be performed.

It now is easy to conceive the manner in which these bellows force the remaining wine out of the cask that is to be emptied: for, upon opening the bellows, the air rushes in at the holes in their bottom; and upon shutting them, it is forced through their nozzle into the cask: the valve just above their nozzle prevents its returning back; and thus a quantity of air sufficient to counter-act the weight of the atmosphere on the wine in the cask that is to be filled, is easily forced into that which is to be emptied.

When the wine is drawn off to within about two or three gallons, a hissing is heard in the cock of the then almost empty cask. The cock in the other should then be turned, so as to close it, and the pipe of communication should be taken away. That done, all the remaining clear wine is drawn off from the cask that is to be emptied, but with great care to stop when it becomes in the least cloudy. This bright wine is then poured into the bung-hole of the cask that is to be filled, and the entire filling of it up is completed with sound wine of the same quality as that which has been drawn off. It is then closely bunged down; and when this has been done, the cock may be taken out, and a plug put in, with very little loss of wine. Or, if the owner be so curious as to desire not to lose any of his liquor, the little air necessarily left near the bung-hole may be drawn off with a small hand-air-pump, and then scarcely a drop of wine will run out when the cock is drawn.

At every racking of this kind a peg-hole is made in the cask, if there be not one before, in order to examine the degree of wasting of the wine: for wine wastes sensibly in keeping, how closely soever the cask be stopped; a part of it transpiring through the pores of the wood: but, as Dr. Neumann observes, it is not the spirituous, but the watery part that is thus lost; for the remaining wine proves stronger than at first, and the strength continues to increase as the quantity diminishes. In filling up the vessels, for it is necessary that they should be kept full, care must be taken never to mix wines of dissimilar qualities.

The Hungarian, for example, does not well bear any other wine, particular rhenish: for if the spontaneous diminution of a cask of Hungarian wine be made up with rhenish, though both of them keep extremely well by themselves, the mixture will presently spoil: and so it is of other wines.

The lees in the several casks that have been racked off may be collected together, and when their thicker part has subsided, a spirit may be drawn from the thinner.

Distempers seldom happen to fermented liquors, but from some fault in the manner of managing them. If the fermentation has been duly carried on, the wine racked off the lees before they can contract a putrid taint, and afterwards kept in an equal degree of heat; the wine will answer the expectation of the maker. When it is to be transported, and thereby necessarily brought into a warmer air, brandy is often added, to check the propensity to a new fermentation. This is also sometimes done to give strength to the wine: but it is not a practice by any means to be recommended.

It is necessary for the preservation of some wines, particularly of such as are apt to be frequently on the fret, to fumigate the casks with burning brimstone, to which some add, perhaps uselesly, vinous spirits and aromatic ingredients. The fumes of brimstone strongly resist fermentation, but wines which are largely impregnated with them cannot be recommended as wholesome. The colour of red wine is destroyed by them. What is called stum, is no other than must whose fermentation has been prevented, or prematurely suppressed, by fumigation with sulphur.

The colour of wine is frequently artificial. A pale yellow may be natural, but a fine deep yellow proceeds from an addition of burnt-sugar, or other colouring matters, or from the oaken cask in which the wine has been kept. Wine may be naturaly of a pale dilute red; but a deep red is almost always the effect of artificial additions, as of the red-woods, elder-berries, bilberries, &c. In France, no secret is made of these practices, the colouring matters being publicly thrown out after they have been used. Turbid wines are fined by a mixture of whites and shells of eggs, powdered alabaster, and isinglass. The use of the shells and alabaster is to correct any small degree of acidity that the wine may have contracted: and indeed if we look into the many compositions made use of by vintners, we shall see that they are all framed upon this principle; wherefore it would be needless here to particularise them. If the wine is grown very sour, the best way of correcting it, so as to preserve the spirit and flavour, is, by adding a quantity of salt of tartar sufficient to neutralize the acid, just before it is to be used. It then becomes a pleasant wholesome liquor: but if salt of tartar is mixed with any fermented liquor long before it is to be used, the effervescence which it raises will deprive the liquor of its spirit, and leave it quite vapid. Isinglass is used only for clarifying the wine. Weak wines are improved by an addition of spirit, particularly before the fermentation is completed; for after this period it is apt to spoil the vinosity. Poor wines are enriched by sweets, and flavoured by various additions so as to emulate the more costly: thus elder-flowers give the flavour of Moselle, and the flowers of the yellow clary will make almost any common white wine resemble new rhenish. Even the most delicious wines have been imitated also without a drop of the juice of any grape; with solutions of sugar, juice of currants, figs, and other fruits.

After the wine, and particularly that of countries where the sun is not very powerful, has passed its fermentation in the

the vat, and is drawn off into casks, it will require something to feed upon. To this end, it will be right always to preserve a few bunches of the best grapes, which may be hung up in a room till there be occasion for them; when they should be picked off the stalks, and two or three good handfuls of them should be put into each cask, according to its size.

The French recommend strongly the two following methods; the one for giving additional strength and colour to red wine, and the other for clarifying wines in general.

For the former, a sound well-hooped cask is set upright on one of its ends, the other end is taken out, and a layer of vine-cuttings is spread at the bottom of the cask, to the depth of about three inches. Some of the finest and ripest black grapes are then chosen, and their berries are cut off from the stalks, as close as possible to the fruit, which the utmost care is taken not to burst or damage. The grapes thus selected are put gently upon the layer of vine-twigs, and the cask is filled with them up to the beginning of the bung-hole. Another layer of vine-cuttings is placed gently upon these grapes, till it reaches the upper part of the bung-hole, and the cask is then filled with grapes, culled as before, to within a foot of the top, where another layer of vine-cuttings is spread over them, and the head of the cask is then replaced. The cask thus prepared is filled with good coarse red wine, to within three fingers breadth of the bung-hole, that the liquor may have room to ferment without much loss, and in this state it is carried gently to the place where it is to remain. Great care is taken to keep this vessel constantly filled up with wine of the same sort, both whilst it ferments, and afterwards as it is used: for if the grapes in it were at any time to be left long without a sufficient quantity of wine upon them, the whole would grow vapid and be spoiled. The principal use which the vintners make of this liquor, is to supply their customers constantly with wine of the same taste and colour, by mixing it with what they sell.

The other method, which is practised only when wine is to be fined very speedily, consists in this. A parcel of very thin chips, the longer the better, or of pretty thick shavings, of new but well dried beech, is steeped for two days in water, which is changed at least twice a day, the better to take off the taste of the wood. These chips are then well drained; and after they have been thoroughly dried in the air, as many of them are put lightly into a cask, of which the head has been taken out for this purpose, as will fill it to within about a finger's breadth of the top. The head is then properly replaced in the cask, so as to fit it for holding liquor, and a pint of good brandy is poured in at the bung-hole, upon the chips. After this, the bung-hole is stopped closely with a bung, and the cask is rolled about till the chips have imbibed all the brandy. The cask is then carried to its allotted place, and immediately filled with some of the wine that is to be speedily fined. The wine will soon be fit for drawing off; and when that is done, the cask with the chips in it should be filled up again directly, because the chips, like the grapes and vine-cuttings beforementioned, will loose all their virtue if they are left long without a sufficiency of liquor upon them.

When the wine that is poured upon these chips begins to require a length of time in order to its becoming fine, it is a sign that they are over-loaded with lees. The head of the cask is then taken out anew, the chips are washed in water till they are cleared of the lees, they are then dried in the air as before, and after being again soaked with brandy, or washed in perfectly clear wine, they are replaced in their former cask; after that this also has been well washed and cleaned, and they continue to answer the same purpose as at first.

All the abovementioned practices are innocent enough: but, as Dr. Neumann rightly observes, some of the dealers in wines have had recourse to such dangerous artifices as have been pernicious to thousands. They have sweetened acid wines by litharge, or other preparations of lead; and impregnated sweet ones with mercury-sublimate and with arsenic. Lead is discovered in wines by adding a decoction of orpiment made in lime-water. If the wine is genuine, it does not sensibly change its colour on this addition, though on standing, a yellowish white powder falls to the bottom: but if it has any saturnine impregnation, its colour becomes immediately darker, brown, reddish, or blackish. Arsenic may be detected by a solution of lead in aqua fortis; and mercury-sublimate, by volatile alkaline spirits, or by a solution of fixed alkaline salts.

As to the concentrating of wines by cold, commonly called condensing or congealing of them, it seems to us so much a matter of mere curiosity, rather than of use, that, though Dr. Stahl has taken the pains to give a full and accurate account of the manner of performing this process, by which the wine is not only freed from its superfluous humidity, so as to be greatly diminished in bulk, and of course rendered more convenient for transportation, but also, say the advocates for this practice, infinitely enriched and ennobled in its quality, and rendered so much more perfect and durable, as to be from thenceforth unalterable by any accident or changes of the weather (for by this means "the philosophic spirit of the wine", to use the language of the adepts, is obtained).

"When wines, says Dr. Neumann, are exposed to the action of a freezing air, a part of their water congeals, and the unfrozen part proves proportionably stronger and more spirituous. By repetitions of this process, first pointed out by Paracelsus, and since carried to a greater length by Stahl, the best wines are reduced to about one sixth of their original volume. Wines thus concentrated or freed from their redundant phlegm, are no longer the delicate liquors they were before. They are too unpleasant, as well as too strong, to be drank by themselves; and when mixed with other wines, they communicate to them also a disagreeable taint. The phlegm which congeals retains a part of the truly vinous matter, as appears from its being convertible into vinegar; but this phlegm, mixed with the unfrozen wine, does not restore its pristine qualities: both the phlegm by itself, and the mixture, soon corrupt. When once the principles of wine are separated from one another, no art can reproduce wine by joining them together again. When barely the inflammable spirit has been distilled off, the addition of that spirit to the residuum does not restore its vinosity. The residuum itself often suffers a new separation upon this addition, its tartareous parts precipitating."

When the wine is of an age at which it usually is bottled, care should be taken to examine whether it be sufficiently bright; because a natural brightness is the most certain indication of the liquor's having undergone a due fermentation, and consequently of its being rendered most wholesome. If any small degree of cloudiness is observed in it, the whites of eggs will easily remove that imperfection; and if it inclines to tartness, the shells of the eggs should be mixed with their whites: but if the degree of cloudiness is thought to be greater than the whites of eggs will cure, recourse is had to isinglass, the quantity of which should be proportioned to the quantity of the liquor, and to its degree of foulness; for wine that becomes bright of itself does not need any. The proper way of using the isinglass, is to dissolve it over the fire in so much water as will form it into a jelly; then to dilute it sufficiently with some of the same wine as it is intended to clarify, afterwards to strain it through a flannel bag, and finally to pour it into the cask, and stir it well about with a whisk that reaches only to about half way down the cask. For wine that is very tart, the proper corrective is powdered marble, alabaster, or un-burnt lime-stone, as before directed.

A quite fashionable gentleman would hardly have vouchsafed, a few years ago, to taste a glass of Champagne which did not sparkle or froth strongly: but that notion of its excellency is now pretty much laid aside. Opinions have been so greatly divided in regard to the cause of this sparkling, some ascribing it wholly to the force of drugs used for that purpose by the dealers in this wine; others imputing it to the un-ripeness, or, as some call it, the tartness of the wine, because, in fact, most of the wines that do sparkle and froth are extremely tart; and others again attributing this effect to the influence of the moon, according to the times of bottling these wines; that we cannot do better than copy here the substance of what the authors of the Maison Rustique have said on this subject.

"It is true that many dealers in wine, seeing how immoderately fond most people were of this sparling liquor, did

did often put into it alum, ſpirit of wine, pigeon's dung, and many other drugs, to make it froth exceedingly; but it is certain, from experience, that the bottling of it at any time between the vintage and the month of May, will alſo make it froth. Some pretend that it froths moſt when it has been bottled neareſt to the time of gathering the particular ſort of grapes of which it was made: but many deny this. There is no time of the year in which it froths more than at the end of the ſecond quarter of the moon in March; and that without any artifice at all. One may always be ſure that the Champagne wine which has been bottled between the tenth and the fourteenth days of the ſame moon will froth perfectly. This has been proved by ſuch reiterated experience, that it cannot be doubted. It is, however, proper to obſerve, that the wine does not froth immediately after its having been bottled. It muſt have been at leaſt ſix weeks, and often two months in bottles, before it will froth well. If it has been tranſported to any diſtance, it muſt be let reſt for a month in the vault, eſpecially in ſummer, to recover itſelf.

" But as the Champagne wines, and particularly thoſe of the mountain of Reims, are not in general ſufficiently ripe for bottling at the abovementioned time, but ſtill retain too much tartneſs, or hardneſs, if the ſeaſon has been cold and moiſt; or too much ſweetneſs, if it has been hot; the ſureſt and beſt way to have exquiſite wine which ſhall froth perfectly, is not to bottle it till the riſe of the ſap in Auguſt. Experience has certified, that it froths exceſſively when bottled between the tenth and the fourteenth of the moon in Auguſt: and as it will by that time have loſt its too great tartneſs, or its over great ſweetneſs, one may be aſſured that the wine which is bottled then will be the ripeſt and moſt frothy.

" Another experiment has been tried, which is, not to bottle the Champagne mountain wine till the ſpring of the ſecond year, that is to ſay, eighteen months after it has been made; and it has been found to froth ſufficiently, though not above half ſo much as that which was bottled while the ſpring-ſap of the preceding year was riſing. It is not thought that the river wine, which has leſs body than that of the mountain, can froth ſo much in the ſecond year.

" They who would have Champagne wine that does not froth at all, muſt bottle it in October or November of the year after the vintage. If it be bottled in June or July, it ſtill will froth a little, though but very little.

" As theſe wines, eſpecially in their firſt year, work continually in the cellars and vaults, and ſtill more in bottles than in caſks, according to the different ſeaſons and the different impreſſions of the air; it is not ſurprizing that the ſame wine, particularly the new, ſhould ſometimes appear different to the taſte. A wine, for example, which is fit for drinking in January and February, ſhall ſeem hard in March and April; becauſe of the riſing of the ſap which then agitates it: and this ſame wine, after ſeeming to be perfectly ripened in the next June and July, ſhall again have, in Auguſt and September following, a hardneſs which could not be perceived in either of the two preceding months; becauſe the riſing of the ſap in Auguſt will have increaſed the motion of its parts, or, in other words, have ſet it on the fret. Thus the ſame Champagne wine, of the firſt year, if it be of the river growth, and frequently that of two years old if it be of the growth of the mountain, will appear more or leſs ripe or mellow, more or leſs exquiſite, more or leſs forward, according to the different motions it receives from the different impreſſions of the air, which vary moſt ſenſibly in the different ſeaſons of the year."

What is here implied, though perhaps not quite clearly expreſſed, is, we apprehend, the true cauſe of the ſparkling or frothing of wine; namely, its not having been perfectly fermented, and conſequently not had a thorough aſſimilation of its conſtituent parts. The want of this certainly makes it fret in the bottle: and accordingly we ſee, that, the better to ſecure its ſparkling, the people of Champagne bottle it in the very ſeaſon when it is moſt likely to be on the fret; viz. at the time of the weather's turning from cold to warm. Several other cauſes may likewiſe put wine on the fret, and among theſe a principal one is the want of cellars in which an equal temperature of the air is preſerved all the year round. This, and the imperfectneſs of the fermentation of the liquor, are undoubtedly the real cauſe of the ſparkling or frothing of wine.

As a general rule, if it be intended that the wine ſhould not froth, the beſt time for drawing it off, whether into bottles, or into caſks, is when the weather is extremely fair and clear, the barometer high, and, of choice, during a northerly wind; becauſe the air is then cooleſt, and the wine leaſt apt to be on the fret. By inverting theſe rules, and drawing off the wine in warm damp weather, when the barometer is low, and the wind ſoutherly; what is bottled at this time will froth; for wine in the caſk is always cloudy then, and conſequently diſpoſed to fret.

It may not be uninſtructive, and certainly cannot be unentertaining to our readers, if we copy here Dr. Neumann's account of, and curſory remarks on, the principal wines that are drank in Europe. " 1. The Madeira iſlands, and Palma, one of the Canaries, afford two kinds: the firſt called Madeira Sec; the latter, which is the richeſt and beſt of the two, Canary or Palm Sec. The name Sec (corruply written Sack,) ſignifies dry; theſe wines being made from half dried grapes. There is another ſort of Sec wine, inferior to both the foregoing, prepared about Xeres in Spain, and hence called, according to our orthography, Sherris, or Sherry. 2. The wines of Candia and Greece, particularly the latter, are of common uſe in Italy. Malmſey was formerly the produce of thoſe parts only, but is now brought chiefly from Spain: it is a ſweet wine, of a golden or browniſh-yellow colour: the Italians call it *Manna alla bocca e balſamo al cervello*, " Manna to the mouth and balſam to the brain." Zant and Cephalonia ſend alſo to Venice ſome good, and no ſmall quantity of indifferent wines: almoſt all the wines indeed made uſe of in the Venetian territories come from Greece and the Morea; of which there are ſome ſorts ſo bad, and ſo cheap, that large quantities are made into vinegar for the preparation of ceruſſe. 3. Italy, not Greece, produces the *vino Greco*: this is a gold-coloured unctuous wine, of a pungent ſweetneſs, the growth of Mount Veſuvious, greatly ſophiſticated by the Neapolitans. In the neighbourhood of Veſuvious is made the Mangiaguerra wine, as alſo a thick blackiſh one called Verracia; and at the foot of the hill, the delicious *vino vergine*. The Italians apply this laſt name likewiſe to all the other wines made without preſſure. The kingdom of Naples affords the Campania or Pauſilippo and Muſcatel, the Surentine, Salernitan, and other excellent wines, as alſo the Chiarello, much drank at Rome. But the principal of all theſe wines is the red, fat, ſweet, and gratefully poignant one, called *Lacbryma Chriſti*. The eccleſiaſtical ſtate produces the light, pleaſant Albano; and the ſweet Monteſiaſcone, a yellowiſh not very ſtrong wine, which comes the neareſt to good Florence, but does not keep well; together with ſeveral of leſs note, as the Nomentan, Monteran, Velitrin, Prænetic, il Romaneſco, d'Orvieto, &c. 5. In Tuſcany are the excellent white and red Florence; the celebrated, hot, ſtrong red wine of Monte Pulciano; the Montalneo, Porte Hercole, &c. But along the coaſt of the Adriatic, at Ancona, Rimini, Peſaro, and as far as Bologna, one meets with exceeding bad wines, chiefly of the boiled unfermented kind, heavy, diſagreeable, and unwholeſome. 6. In Lombardy alſo there is abundance of bad wines: the Modeneſe and Monſerrat are tolerable; the Marcemino, produced about Vicenza and Padua, pretty good. The other wines moſt commonly drank in that province are the Breſcian, Veroneſe, Placentine, Lumelline, and Pucine; and in the Genoeſe, the Vino di monte vernaccia, vino amabile or vino di cinque terre, and Vino razzeſe. Between Nizza and Savona is produced an incomparable Muſcadine; near Aquileia is the Roſatz, and near Pavia the Vino Piccante. 7. Piémont and part of Savoy have excellent light wines. 8. The Sicilian, Sardinian and Corſican wines are alſo good: the firſt, as particularly the Catanian, Panormitan, Meſſinian, and Syracuſan, are accounted the beſt, and are chiefly bought up by the Knights of Malta. 9. Moſt of the Spaniſh wiſhes are compoſed of fermented or half fermented wine, mixed with inſpiſſated muſt and variouſly manufactured, or of an infuſion of dry grapes in weak muſt. No wines freeze more difficultly than the Spaniſh; theſe abounding both

both with unctuous matter and with inflammable spirit. The principal of them are, the Alicant, which is a thick, strong, very sweet, and almost black as well as nauseous wine; Sherry, Spanish Malmsey, Malaga, commonly called Mountain, and what is simply termed Spanish wine. These, at least, are the sorts most generally imported here: but in Spain itself there are many more, such as, the Tarragon, Salamanca, Cordova, Galicia, Andalusia, sundry bastards, vino de toro, &c. 10. In Portugal there is plenty of red Port, a cheap but not a very excellent wine, drank in large quantities in England, and often dreadfully sophisticated. The best vino tinto, a blackish red wine used by the coopers for colouring other wines, is said by some to be the produce of Portugal. So largely do the Portuguze deal also in Madeira, that their king receives yearly twelve thousand pipes of this wine by way of tythes. 11. In France, there is a great variety of wines; of which the strong, sweet, full-bodied, spirituous ones are called *Vins de liqueur*. There is scarcely a province in France that does not produce wine: Languedoc and Provence afford the sweetest; and the same provinces, with Champagne and Burgundy, the strongest. The wines of the northern parts of that kingdom, as Picardy and Bourdeaux, are the worst; and those about its middle, as Paris and Orleans, of a middling kind. The most celebrated of the French wines are those of Champagne and Burgundy, the Cote rotie, St. Laurence, Frontignac, Muscat de Lion, Cahors, Hermitage, Grave, &c. 12. In Swisserland, the best are the Neufchatel, Velteline, La cote, and Reiff wines. The Velteline straw-wine, so called from the grapes being laid for some time upon straw before they are pressed, is particularly celebrated. 13. The dry-grape wines of the Upper-Hungary are in general excellent, and greatly superior to those of the Lower. They have a delicious aromatic smell and taste, a notably diaphoretic, and corroborating virtue, and when drank freely occasion no head-ach, heaviness of the limbs, or other inconveniencies. They do not easily become vinewed even in open vessels; and retain their sweetness and agreeableness for a length of time, though they lose a little of it from year to year. 14. Among the German wines, the Tyrol are very delicate, particularly those of Tramin and Etsch; but they do not keep. 15. Good Austrian wine is not to be rejected. Those of Kloster-Neuburg and Brosenberg are accounted the best, and, in the opinion of some, excel in taste that of Edenburg in Lower Hungary. There are also good wines in several other parts of the imperial dominions. 16. In the Palatinate, the best wine is that of Worms, especially the sort called women's milk; and next to this, those of Edinghoff and Ambach. 17. Among the more esteemed German wines are to be reckoned also Rhenish, Mayne, Moselle, Neckar, and Elsass. A certain writer calls the Rhenish made in Hockheim (hock) the prince of the wines of Germany. 18. The Bohemian, Silesian, Thuringian, Misniam, Naumberg, Brandenburg, and other German wines, are generally inferior to the foregoing. Some however, of those of Misnia and the Marche, made from ripe picked grapes, have this advantage, that they are greatly meliorated by age, so as to be preferred by many to the Rhenish, Neckar, and Franconia wines, and frequently mixed with other of greater note. The tartish German wines keep the longest of any: some of them have been kept two or three hundred years; and in Strasburg there is a cask of it fourteen hundred years old, and many above seventy; the wine being occasionally racked off into smaller and smaller casks, that the vessel may be constantly full. These very old wines are preserved rather for curiosity than use, as they not only grow too strong for drinking, but at last quite disagreeable. The best are those of a middle age, from twenty to about fifty years."

We cannot close more properly, than with the above quoted excellent chemist's definition of the characters of good wine.

"The goodness and wholesomeness of wines are judged of, from their being bright, clear, and sparkling in the glass; of an agreeable reviving smell and taste; leaving, when held in the mouth for some time, a slight sense of astringency; being moderately strong and spirituous; passing freely by urine; exciting appetite; producing a gentle sweat in the night; keeping the belly open next day; without being followed by any head-ach, heaviness of the limbs, or other uneasiness. Such a wine, moderately used, is a very valuable cordial. The sweet rich wines are either new, or very strong and fiery: they heat the body much more, and, if drank to any degree of excess, their effects continue much longer than those of the thinner wines, which contain an equal quantity of spirit. The red wines, in general, have the greatest astringency."

The following directions for making domestic wines, taken from the Museum Rusticum, will, we are persuaded, be agreeable to our readers.

"As to the art of making wine, I think the rendering it more generally known, and practised here, may not only afford a convenience with regard to expence, and a security with regard to health, to private persons; but an advantage to the public, in the balance of trade: a principle, at present, overlooked: though, in a short time, it will probably be seen in a more interesting light.

"Among the various articles of foreign luxury, wine certainly makes one of the most capital; and yet, what with the taking such extreme great quantities, as oblige us to receive, as well the product of inferior, as good vintages; and what with adulteration, as well practised before the wine is imported hither, as after; we in general drink very indifferent natural wines, or very exceptionable artificial mixtures of liquors, called so. Though for these, we either pay great annual sums to foreign countries, or to those, who make it their business to impose upon us at home.

"This is the more to be regretted: because we have it in our power wholly to avoid it: and, by a little attention and trouble to provide ourselves with wine, that is superior in flavour, cordial effect, wholesomeness, and every other quality, with a saving of at least fifty or sixty *per cent.* of the expence. The means, by which, I suggest it to be in our power to do this, is, by the domestic production of wine in our own families: which, were the art well known, and the advantages, as I have here enumerated them, well understood, could not surely fail to be a much more general practice than it is at present.

"It may be said to appear from experience, that wine thus made here, is not so good as the foreign: and that, we find, in the instances of those, who have tried to introduce it, the success is not equal to my representation. To this, I answer, that experience has verified what I advance, in the few instances of those, who have made domestic wine with skill; and kept it to be of a due age: without which, even foreign wine would not be good. But the reasons, why greater numbers do not succeed, is the want of knowledge; a sordidness, with respect to expence; or the drinking the wine before it be fit: which is almost universally the case. For, where this art has been practised without any of these disadvantages, such wine has been produced, as not only has equalled the foreign, in all general good qualities; but has even been mistaken for several of the most valuable kinds, even by the most skilful judges.

"The want of knowledge in the art of making domestic wine, being, therefore, one principal cause of the neglect of doing it more frequently, I shall here endeavour to remove it, by furnishing such instructions, as can scarcely fail to enable any attentive person to practise it, with ease and certainty. And, I am persuaded, that, to middling people, especially those living in villages and places remote from sea-ports, where it is difficult to procure even indifferent wine in small quantities, I shall do a material kindness: tho' the advantage of making domestic wines is by no means, confined to such persons, or situations; but even all others might find their account in it, both with respect to expence and health.

"I will, therefore, first give a recipe for making the most perfect wine, that can be produced, by composition, in this country. By composition, I mean, such as is not made of the simple native juice, of any one kind of fruit. But this kind is, indeed, in a great degree native, as the water added to the dry fruit is only, in fact, the restoration of what evaporated in the drying and ripening the fruit: and the produce of this process is, therefore, in reality, a natural wine, and superior to any, that can be made of the native juices of the fruits of our country; or perhaps equal to the beſt of thoſe of any other. This recipe will ſerve, alſo, as a baſis, for the ſhowing afterwards how other, and cheaper kinds, may be made.

" Take thirty gallons of ſoft water, either rain, or river water. It ſhould be obtained in as clear a ſtate as poſſible, but boiling is needleſs. Put this water into a veſſel, at leaſt, one-third bigger than will contain that quantity: and then add to it one hundred weight of Malaga raiſins, groſsly picked from their ſtalks. Mix the whole well together, that the raiſins may not remain clotted in lumps: and then cover it partly, but not intirely, with a linen cloth; and let it ſtand in a warm place, if the ſeaſon be not hot. It will ſoon begin to ferment; and muſt be well ſtirred about, twice in twenty-four hours, for twelve or fourteen days. It muſt be then examined, by the taſte, to try if the ſweetneſs be nearly gone off: and if that be found ſo, and the fermentation be greatly abated, which will be perceived by the raiſins beginning to lie quietly at the bottom, the fluid muſt be ſtrained off; and preſſed out of the raiſins, firſt by the hand, and afterwards by a preſs, if ſuch be eaſily procured. But, if there be no preſs, two boards may be uſed with the aſſiſtance of a large weight, or other ſtrong compreſſive force; which muſt be continued as long as any fluid can be made to drop from the maſs. The fluid, thus ſeparated from the ſkins, or marc of the raiſins, muſt be then put in a good ſound wine caſk, well dried and warmed, together with eight pounds of Liſbon ſugar, and a little yeaſt: but ſome part of the liquor muſt be kept out, to be added, from time to time, as the abatement of the fermentation, that will come on again, may admit, without the wine riſing out of the caſk. In this ſtate it muſt continue for a month, with the bung-hole open: and then, the whole of the liquor kept out, having been now put in the veſſel, muſt be cloſely ſtopped up; ſo that no air may enter: and in this ſtate it muſt be kept for a year, or longer. At which time, it may be bottled off.

" This wine may be drunk, and will be very good at the end of a year and half: but it will be much better, if kept longer: and will improve for four or five years. When it has a proper age, it will equal any of the ſtrong cordial foreign wines: and may, by the addition of proper ſubſtances to flavour and colour it, be made to reſemble them.

" This is the moſt perfect kind, of what may be called artificial wine; but others may be made cheaper. There are two methods of making a ſaving in the expence. The one is, to ſubſtitute, inſtead of the whole quantity of raiſins here directed, a greater proportion of ſugar: leaving out four pounds of raiſins for one of ſugar added: or the quantity of both ſugar, and raiſins, may be diminiſhed; and a proportion of clean malt-ſpirits added, when the bung of the caſk is cloſed up. The uſe of diſtilled ſpirits, in this manner, is not ſo objectionable, as it may at firſt appear to perſons, who are not acquainted with theſe matters. For ſuch ſpirits will loſe their fiery quality, and be rendered ſoft and mellow, by their incorporation with the oily part of the wine. And there is nothing more certain, than that the practice of uſing them is general in the preparation of all the foreign wines, for our market: and moſt particularly thoſe ſtronger kinds, which are moſt eſteemed by us.

" Any other kind of large raiſins, which are cheap, may be uſed, as well as the Malaga: and the thinner the ſkins, and the ſweeter the pulp, the ſtronger will be the wine.

" It has been practiſed formerly to bruiſe the raiſins; but it is unneceſſary with reſpect to the common ſorts, as they will ſoon burſt with the fermentation; and freely give out their contents. But there are ſome ſmall kinds with tough ſkins, which, if employed for this purpoſe, ſhould be bruiſed: or they will reſiſt the penetration of the water. Theſe kinds are not, however, ſo good for the purpoſe of making wine as the larger; or, at leaſt, if they be choſen for any particular flavour, they may give the wine, there ſhould be only a certain proportion mixt, added to ſome of the other kinds: and, in this caſe, they ſhould be firſt bruiſed.

" The practice of a double fermentation, as here directed, firſt of the raiſins themſelves, and afterwards of the ſugar, is not the common method: and very good wine may be made, by fermenting both at the ſame time. But this method is, nevertheleſs, preferable; for it ſometimes happens, from ſome unknown circumſtances in the fermentation, when ſuch method is not practiſed, that the wine will turn out cloudy, and not admit of being fined, by any means at preſent underſtood: which accident is prevented by this double fermentation remaining, as the ſecond perfectly works all the remaining half fermented part of the pulp. Moreover, in conſequence of this more perfect fermentation, the wine is lighter, and becomes wholeſome and perfect with leſs age: the glutinous matter of the raiſins being intirely reſolved.

" Of this wine, by adding the proper flavour, may be formed, imitations of all the natural wines, of a very ſtrong body: and, by abating the proportion of raiſins, ſugar, or both, other ſmaller kinds, may, by the ſame means, be produced.

" If this wine be perfectly fermented, and kept a long time, ſo that no ſweetneſs remain, it will reſemble Madeira: and has very frequently paſſed for it.

" An imitation of Frontiniac may be made, by the wine, in which the proportion of ſugar, or of malt-ſpirits, to the raiſins, is large; and the whole body weaker. The muſcadel flavour of Frontiniac, being exactly to be imitated, by an infuſion of the flowers of meadow-ſweet, in ſome of the wine: and added in that proportion, which may be found ſufficient to raiſe the due degree of the flavour. In the making this artificial Frontiniac, the fermentation ſhould be ſtopt, by cloſing the caſk, and adding the ſpirit, while a conſiderable ſweetneſs yet remains: and the wine may be drunk after it has been a ſhort time in bottles.

" Cyprus wine may be imitated, alſo, by the ſame means: the infuſion of the meadow-ſweet being added to the wine prepared in the beſt manner above directed. But, in this caſe, three or four pounds more of ſugar, than the quantity given in the recipe, ſhould be uſed; and the fermentation ſtopt, while a conſiderable degree of ſweetneſs remains. This kind will be the better for age: and, if properly managed, can never be diſtinguiſhed, even by actual compariſon, from the true Cyprus: as I can aſſert from the fact itſelf.

" The imitation of mountain is to be made, by preſerving a ſmall degree of ſweetneſs, giving the nut-like flavour, and keeping the beſt kind of the above wine to a due age. This nut-like flavour may be obtained, by the infuſion of the Florentine orris-root, powdered with a very ſmall proportion of orange and lemon-peel: and the wine may be rendered more dry or ſweet, by continuing the fermentation a greater or leſs time; and adding a correſpondent proportion of clean malt-ſpirits, when the fermentation is ſtopt ſooner. The adding ſome of the ſtony ſeeds of the raiſins well bruiſed, alſo, gives the nut-like flavour: and the putting in a part of the ſtalks of the raiſins, gives a ſharpneſs, found in general in this kind of wine.

" The racy taſte of canary, now commonly called ſack, may be counterfeited by the addition of a proper quantity of the juice of white currant-berries to the wine, made with a large proportion of ſugar to the raiſins; and left very ſweet in the fermentation. But it is ſaid, that a ſpirit, diſtilled from the leaves of clary and clean malt-ſpirits, and put to the wine, will give to it ſuch a ſtrong reſemblance of ſack, as renders it abſolutely undiſtinguiſhable from that wine.

" It is ſaid, alſo, that the juice of the bramble-berries, added to the mixture of the wine, before the fermentation, gives both the exact colour, and flavour of claret. But, in this caſe, the quantity of raiſins ſhould be conſiderably diminiſhed, and that of the ſugar increaſed, though not to the full proportion: as the fermentation muſt be continued till all ſweetneſs be deſtroyed; and this wine is not intended to have ſo great a body as the others.

" It is better, therefore, for this imitation of claret, to work it only of moderate ſtrength; and to add ſome proportion of diſtilled ſpirit: it will be perfect at the end of two years. This, and the imitation of ſack by the ſpirit of clary, I have never ſeen tried: but have them on very good authority. I ſhould be apt to believe, a ſmall proportion of red-argol, or tartar, diſſolved in ſome of the wine, and added together with the ſpirit, when the bung is cloſed up, would aſſiſt the imitation very m ateriall.

" Any

"Any intelligent perſon may eaſily collect, from theſe inſtructions, ſufficient lights to qualify them to make better or cheaper kinds of wine, according to their inclination. But whatever kind is made, at leaſt a year ſhould be given to it: and, in moſt caſes, a longer time. For nothing has ſo much contributed to the diſcrediting, and excluding the uſe of domeſtic wines, as the drinking them too new: eſpecially after an injudicious, and undue management of the fermentation; by which means they have been made to appear flatulent, aceſcent, and foul. But the very oppoſite of theſe qualities will be found in them, when properly treated and kept."

To WINNOW, to clear corn from the chaff, &c. *See the article* THRASHING.

WITHERS, the part of a horſe where the ſhoulder bones join at the bottom of the neck and mane.

All pinches of the ſaddle on the withers, ſhould be treated with repellers; for this purpoſe bathe the tumor well with hot vinegar three or four times a day: if that does not ſucceed alone, an ounce of oil of vitriol may be put to a quart of vinegar, or half an ounce of white vitriol diſſolved in a little water, and added to the ſame quantity. Theſe are generally very effectual repellers for this purpoſe in horſes, and will frequently prevent impoſthumation: when the ſwelling is attended with heat, ſmarting, and little hot watery pimples, the following mixture will then be more proper to bathe with.

> Take two ounces of crude ſal ammoniac, boiled in a quart of lime water, where that cannot be had, a handful of pearl or wood aſhes may be boiled in common water; pour off the decoction when ſettled, and mix with it half a pint of ſpirit of wine: anoint the part afterwards with linſeed oil, or elder ointment, to ſoften and ſmooth the ſkin.

But when theſe ſwellings are critical, the conſequence of a fever ſettled on this part, you muſt avoid the repelling method, and aſſiſt in bringing the ſwelling to matter, by means of ſuppurating poultices: experienced farriers, adviſe, never to open theſe tumors till they break of themſelves; for if they are opened before they are ripe, the whole ſore will be ſpongy, and diſcharge a bloody ichor, which ſoon degenerates into a ſordid ulcer. But take care to inlarge the openings and pare away the lips, that your dreſſings may be applied eaſily; and avoid the ligament which runs along the neck to the withers: if a gathering forms on the oppoſite ſide, open it in the ſame manner, but take care they incline downwards, for the ſake of depending orifices, and letting the matter flow off eaſily, and if the bones ſhould be found foul, they muſt be dreſſed with tincture of myrrh till they ſcale off: if the fungus is very troubleſome, and the diſcharge, oily, yellow and viſcid; pledgits ſoaked in the following, made hot, have been found very effectual, bathing the ſwelling round with ſpirit of wine and vinegar.

> Take half an ounce of blue vitriol, diſſolved in a pint of water; oil of turpentine, and rectified ſpirit of wine, of each four ounces; white wine vinegar, ſix ounces; oil of vitriol and Ægyptiacum, of each two ounces.

Theſe ſharp liquid applications are often found more efficacious dreſſings than ointments with precipitate, or verdigreaſe, or indeed any other digeſtives; as they inſinuate themſelves more readily into the interſtices of the funge, or little quag-holes, ſo commonly obſerved in theſe kind of ulcers; and at the ſame time, level and deſtroy the riſing, and exuberant pupillæ; whereby the ulcer grows more ſmooth and dry, ſoon heals up, and cicatriſes.

When the cavities are truly fiſtulous, the calloſities muſt be cut out, where it can be done, with a knife; and the remainder deſtroyed by corroſives; viz. precipitate, burnt allum, and white vitriol. *Bartlet's Farriery, pag.* 273.

WITH-WIND, *ſee the article* BIND-WEED.

WOAD, the Engliſh name of a plant, called by botaniſts *Iſatis ſativa, vel latifolia.*

This plant puts forth ſtems about three feet high, and of the thickneſs of a man's finger: theſe divide at their top into ſeveral branches loaded with many leaves irregularly placed; and theſe leaves, which reſemble pretty much thoſe of dog's-tongue, are ſleek, and of a bluiſh green colour. The branches bear alſo great numbers of flowers compoſed of four yellow petals diſpoſed croſs-wiſe: the pointal becomes a capſule flattened on the edges, and each capſule contains two oblong ſeeds: the root is large, woody, and penetrates deep into the ground. This plant delights in a warm climate, ſuch as Italy and the ſouthern parts of France; though it has likewiſe been cultivated in Normandy, and is ſaid to ſucceed in Germany; as experience has ſhewn that it does alſo in this country.

A light, black, kindly, and rich ſoil, or a meadow newly broken up, is choſen for the cultivation of woad; but it muſt not by any means be ſown on ſtoney or ſhallow land. It thrives well in plains, but ſtill better on the ſouth ſide of a hill: the eſſential point is, that the ſoil be good, and that it have the above-mentioned qualities.

Though the land which is intended for woad be never ſo good, it muſt be dunged a year before it is ſown with this plant, and be made firſt to bear a crop of wheat, or of onions, &c. After theſe are taken off, three deep ſtirrings ſhould be given with the plough, or, which is much better, with the ſpade: the firſt ſtirring ſhould be in November, and the other two in February, March, or April. If the land which is intended for woad lies flat, and has not ſlope enough to carry off the wet, channels muſt be cut of a greater or leſs ſize, according as the ground is more or leſs diſpoſed to retain the water.

In warm climates, woad is ſown ſo early as the beginning of April, unleſs the weather chances then to be too cold, in which caſe this ſowing is deferred till the beginning of May: but for countries like ours, where the ſpring is attended with froſts, particularly in the night, Mr. Miller is certainly right in adviſing to lay the land up in narrow high ridges juſt before winter, that the froſt may mellow it; to croſs-plow it in the ſpring, laying it again in narrow ridges, and between this time and the enſuing month of June to harrow it well twice, at different intervals, in order to root up whatever weeds may have appeared; then, in June, to give the ground a third plowing as deep as the plough will go, making the furrows narrow; after this, to harrow it again when any new weeds are come up; and finally, towards the end of July, or the beginning of Auguſt, to plow it for the laſt time, laying it as ſmooth as poſſible. A good harrowing after this will fit it completely to receive the ſeeds, which, if rain falls ſoon after their being ſown, or if they are ſteeped in water during the night before the ſowing, as Mr. Miller adviſes, will appear in a fortnight, if the ſeaſon be favourable. They ſhould be but lightly covered, and ſhould be ſowed ſo thin as that the plants may ſtand ſix inches aſunder. Some ſtrew pigeon's dung on the land juſt after having ſown it with woad, and the plants become much the finer for this manure.

It is a common cuſtom to ſow woad in broad-caſt: but all plants which require being hoed ſhould certainly be ſowed in rows, becauſe this method greatly leſſens the labour and time of hoeing; and beſides, it is much eaſier, in this caſe, to give each plant its due diſtance.

When the woad is grown large enough to be diſtinguiſhed, it ſhould be carefully cleared of all weeds, for theſe would hurt it greatly; and at the ſame time the plants ſhould be thinned wherever they ſtand too cloſe: without this precaution, the woad would produce but very few leaves, and would remain extremely ſtinted in its growth.

The intervals between the plants ſhould be ſtirred whenever the ſeaſon requires it; and in the doing of this, by which the weeds thereby rooted out will ſoon be deſtroyed in dry weather, care ſhould be taken to lay a little earth up around the ſtems of the woad. M. Du Hamel, whoſe account we have here reſumed, ſays he has been aſſured, that, in countries where there is a conveniency of water, the woad-grounds are flooded: but to reap any benefit from this practice, the water ſhould be in ſufficient plenty for the huſbandman to be able to repeat the flooding frequently; for otherwiſe the heat of the ſun, after

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having exhaled the water too foon, would harden the furface of the earth, and thereby greatly injure the plants.

Woad generally affords two crops in the fame year, and fometimes, when the feafon has been favourable, it has yielded even four. The two firft are the beft, and thefe are commonly mixed together in the manufacturing of this plant: but the after-crops are always kept feparate; for if thefe are mixed with the other, the whole will be fpoiled. The two firft crops will fell for from twenty-five to thirty pounds a ton; but the latter will not bring more than feven or eight pounds, and fometimes not fo much. An acre of land well hufbanded will produce a ton of woad, and in good feafons near a ton and a half. The firft crop is gathered towards the end of Auguft, and the laft at the end of October, or in the beginning of November: but this laft crop muft be got in before the firft frofts come on; for the leaves that might be gathered afterwards would not be worth any thing. When the plant is ripe, which is known by its firft leaves beginning to dry, all the leaves are cut off by a man who grafps the plant by handfuls, and they are then laid in a heap to wither. Whilft they are in this fituation, they muft be fheltered from the fun and rain, and they muft be frequently turned, in order that they may heat equally: they are then carried to a mill fomewhat like that which is ufed for preffing the oil out of linfeed, and are there ground till they are reduced into a pafte, which is afterwards formed into cakes of about a pound weight, and thefe are laid to dry in a covered place where neither the fun nor rain can come at them. This pafte is dried thus for about a fortnight, that is to fay, till it has acquired confiftence enough to be formed into fmall roundifh lumps, by means of little wooden moulds into which it is put for that purpofe. As faft as thefe lumps are taken out of the moulds, they are laid upon wicker hurdles loofely woven, fo as not to touch one another, and in fuch manner that the air may come at every part of them, as is practifed in the drying of ftarch. Thefe lumps become very hard, and in this condition it is that they are fold. When they are to be ufed, they muft be fteeped a long while in water before they can be broken.

The woad thus prepared yields an excellent blue dye, very lafting, and with which all the degrees of this colour may be made. It is not long fince this plant was preferred to indigo: afterwards, through a kind of toleration, the dyers were allowed to put a fmall quantity of indigo into their vats of woad; but now that the making and manner of ufing indigo have been greatly improved, it is looked upon as a matter of indifference whether that or woad be ufed for dying blue.

At the laft cutting of the woad, and with that cutting, the crown of the root is taken off; whereas only the leaves were gathered in the preceding cuttings. When it is intended to fave the feeds of woad, a fmall portion of the plantation fhould be allotted for this purpofe at the laft cutting, and then a part only of the leaves there fhould be taken from the plants: but it is proper to retrench fome of them, becaufe experience has fhewn that the plants on which all their leaves are left run to feed too foon, and that their feeds have in this cafe often been deftroyed by the cold of the enfuing fpring. Thus woad, being a biennial plant, fhould not be fuffered to feed before the month of Auguft in the fecond year after it has been fown; and therefore fome of its leaves fhould be cut off in October, to prevent its being too forward.

Befides cold, weeds, and drought, which are very pernicious to woad, locufts will fometimes devour a whole field of it in an evening. When thefe enemies are obferved, all the leaves fhould be immediately cut off, that the plants may put forth new ones.

The fame field fhould not be made to bear a fecond crop of woad immediately after the firft; for this plant is a great impoverifher of the ground: but after it has been taken off, wheat may be fown the firft year, millet the fecond, and in the third it may be laid down again to woad, if it has been well manured.

WOLVES TEETH, a name given to thofe teeth, which grow in fuch a manner, that their points prick, or wound either the tongue, or gums, in eating. Old horfes are moft liable to this infirmity, and whofe upper overfhoot the under teeth in a great degree.

To remedy this evil, you may either chop off the fuperfluous parts of the teeth with a chizzel and mallet, or file them down, which is the better way, till you have fufficiently wafted them.

WOOD, a large and thick plantation of trees.

Woods and groves are the greateft ornaments to a country feat; therefore every feat is greatly defective without them, wood and water being abfolutely neceffary to render a place agreeable and pleafant. Where there are woods already grown to a large fize, fo fituated as to be taken into the garden or park, or fo nearly adjoining, as that an eafy communication may be made from the garden to the wood; they may be fo contrived by cutting of winding walks through them, as to render them the moft delightful and pleafant parts of a feat, efpecially in the heat of fummer, when thofe walks afford a goodly fhade from the fcorching heat of the fun.

Where perfons have the convenience of grown woods near their habitation, fo as that there may be an eafy communication from one to the other, there will be little occafion for wilderneffes in the garden; fince the natural woods may be fo contrived, as to render them much pleafanter than any new plantation can poffibly arrive to within the compafs of twenty years, where the trees make the greateft progrefs in their growth; and in fuch places where their growth is flow, there cannot be expected fhade equal to the grown woods in double that number of years; but there is not only the pleafure of enjoying a prefent fhade from thefe woods, but alfo a great expence faved in the planting of wilderneffes, which, if they are large, and the trees to be purchafed, will amount to no fmall fum.

If the wood is fo fituated, as that the garden may be contrived between the houfe and that, then the walk into the wood fhould be made as near to the houfe as poffible, that there may not be too much open fpace to walk through in order to get into the fhade; if the wood is of fmall extent, then there will be a neceffity for twifting the walks pretty much, fo as to make as much walking as the compafs of the ground will admit; but there fhould be care taken not to bring the turns fo near each other as that any two walks may be expofed to each other, for want of a fufficient thicknefs of wood between; but where the wood is large, the twifts of the walks fhould not approach nearer to each other than fifty or fixty feet; or in very large woods they fhould be at a greater diftance; becaufe, when the underwood is cut down, which will be abfolutely neceffary every tenth or twelfth year, according to its growth, then the walks will be quite open until the underwood grows up again, unlefs a border of fhrubs, intermixed with fome evergreens, is planted by the fides of the walks; which is what we would recommend, as this will greatly add to the pleafure of thefe walks.

Thefe wood walks fhould not be lefs than eight or nine feet broad in fmall woods; but in large ones fifteen feet will not be too much; and on each fide of the walks, the border of fhrubs and evergreens may be nine or ten feet broad; which may be fo managed, as to fhut out the view from one part of the walk to the other at thofe times when the underwood is cut down; at which times there will be an abfolute occafion for fuch plantations, and at all times they will afford great pleafure by adding to their variety, as alfo by their fragrant odour.

The former method, which was practifed in cutting thefe walks through woods, was to have them as ftraight as poffible; fo that there was much trouble to make fights through the woods, for direction how to cut them; but where this was practifed, every tree which ftood in the line, good and bad, was cut down, and many times boggy or bad ground was taken into the walks, fo that an expence of draining and levelling was neceffary to render them proper for walking on; befides this, there were many other inconveniences attending thefe ftraight cuts through woods, as, firft, by letting in a great draught of air, which in windy weather renders the walks unpleafant; and thefe cuts will alfo appear at a great diftance from the woods, which will have a very bad effect; therefore the modern practice of twifting the walks through woods is to be preferred. In the cutting of thefe walks there fhould be particular care taken to lead them over

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the ſmootheſt and ſoundeſt part of the ground, as alſo to avoid cutting down the trees; ſo that whenever theſe ſtand in the way, it will be better to lead the walk on one ſide than to have the tree ſtand in the middle; for although ſome perſons may contend for the beauty of ſuch trees which are left ſtanding in walks, yet it muſt be allowed, that unleſs the walk is made much broader in thoſe places than in the other, the trees will occaſion obſtructions to the walkers or riders, eſpecially when ſeveral perſons are walking together; ſo that it will be much better to have the walks entirely clear from trees; and where any large ſpreading tree ſtands near the walk, to cut away the ſmall wood ſo as to make an opening round the trees, where there may be ſome ſeats placed for perſons to reſt under the ſhade. The turns made in theſe walks ſhould be as eaſy and natural as poſſible; nor ſhould there be too many of them, for that will render the walking through them diſagreeable; therefore the great ſkill in making of theſe walks is, to make the turns ſo eaſy as not to appear like a work of art, nor to extend them ſtraight to ſo great length, as that perſons who may be walking at a great diſtance may be expoſed to the ſight of each other; both theſe extremes ſhould be avoided as much as poſſible, ſince they are equally diſagreeable to perſons of true taſte. When a wood is properly managed in this way, and a few places properly left like an open grove, where there are ſome large trees ſo ſituated as to form them, there can be no greater ornament to a fine ſeat than ſuch a wood.

We ſhall now treat of the culture of woods for profit to the poſſeſſor, and public benefit of the nation.

The great deſtruction of the woods and foreſts which has been of late years made in this country, ſhould alarm every perſon who wiſhes well to it; ſince there is nothing which ſeems more fatally to threaten a weakening, if not a diſſolution, of the ſtrength of this once famous and flouriſhing nation, than the notorious decay of its timber: and as this devaſtation has ſpread through every part of the country, ſo unleſs ſome expedient be ſeriouſly and ſpeedily reſolved on, to put a ſtop to this deſtruction of the timber, and alſo for the future increaſe of it, one of the moſt glorious bulwarks of this nation, in a few years, will be wanting to it.

And as there are ſmall hopes of this being remedied by thoſe entruſted with the care of public woods, ſince their private intereſt is ſo much advanced by deſtroying the timber, which they were appointed to preſerve; therefore, unleſs private perſons can be prevailed on to improve their eſtates, by encouraging the growth of timber, it is greatly to be feared, that in an age there will be a want of it for the ſupply of the navy; which, when ever it happens, muſt put a period to the trade of this country.

It has been often urged, by perſons whoſe judgment in other affairs might be depended on, that the great plantations, which for ſeveral years paſt have been carried on in ſeveral parts of this kingdom, will be of public benefit by the propagation of timber; but in this they are greatly miſtaken, for in moſt of the plantations which have been made for years paſt, there has been little regard had to the propagation of timber, preſent ſhade and ſhelter have been principally conſidered; and in order to obtain theſe ſoon, great numbers of trees have been taken out of woods, hedge rows, &c. which, if they had remained in their firſt ſituation, might have afforded good timber, but being tranſplanted large, are abſolutely rendered unfit for any uſe but fuel; ſo that the great quantity of plantations which have been made, I fear, will rather prejudice than be of uſe to the improvement of timber; nor is there any other method of increaſing the uſeful timber of this country, than by ſowing the ſeeds in the places where they are to remain, or in ſuch ſituations where there are plenty of oaks in the neighbourhood; if the ground is properly fenced, to keep out cattle and vermin, the acorns which drop from thoſe trees will ſoon produce plenty of young trees, which, if properly taken care of will ſoon grow to be large.

The two moſt ſubſtantial timbers of this country are the oak and cheſnut; though the latter has been of late years almoſt entirely deſtroyed in England, ſo that there are ſcarce any remains of trees of ſize in the woods at preſent; but there can be no doubt of this tree having been one of the moſt common trees in this country, as may be proved by the old buildings in many parts of England, in which the greateſt part of the timber is cheſnut. Next to theſe, the elm is eſteemed as a profitable timber; but of theſe there are few cultivated in woods, eſpecially in the ſouth part of England, where they chiefly grow in hedge-rows, or plantations, near houſes; but in the north-weſt part of England, there are numbers of very large trees of the witch-elm growing in parks, and ſome in woods, as if that tree was a native of this country, which has been much doubted; though as this tree propagates itſelf by ſeeds, it may be deemed an indigenous plant in England.

The beech is another tree common in the woods, eſpecially upon the chalky hills of Buckinghamſhire, Kent, Suſſex, and Hampſhire, where there are ſome very large woods entirely of this ſort; ſome of which have been of long ſtanding, as appears by the age of the trees; but whether this tree is a native of this country, has been a point often diſputed.

The aſh is a very profitable tree, and of quick growth; ſo that in leſs than an age, the trees will arrive to a large ſize from the ſeeds, therefore a perſon may hope to reap the profits of his labour, who ſows the ſeeds; but this is not a beautiful tree to ſtand near a habitation, being late in the ſpring in putting out its leaves, and the firſt that ſheds them in autumn; nor is it a friendly tree to whatever grows near it, the roots drawing away all the nouriſhment of the ground, whereby the trees or plants which grow near are deprived of it; ſo that where the aſh grows in hedge-rows, the hedges in a few years are entirely deſtroyed; and if they are in paſture-grounds, and the cows browze on them, the butter made with their milk will be bad; for which reaſon the aſh ſhould be ſown ſeparate in lands which are incloſed, where cattle are not permitted to come, and at a diſtance from the habitation.

Upon ſandy or rocky ſoils, the Scotch pine will thrive exceedingly, and turn to great advantage to the planter, provided the plants are planted young, and treated in a proper manner. There are alſo ſeveral aquatic trees, which are very profitable to thoſe who have low marſhy lands, where the harder kinds of timber will not thrive; theſe are the poplars of ſeveral ſorts, the willow, alder, &c.

Where there are young woods, great care muſt be taken of the fences; for if cattle ſhould get in among the trees, they will, in a ſhort time, do infinite damage to them, by browzing on their branches, or barking the trees; and during the firſt ten years of their growth, they ſhould be ſecured from hares and rabbets, otherwiſe, in ſevere froſt, when the ground is covered with ſnow, whereby they are deprived of other food, they will get into the woods, and eat off the bark from the young trees, and gnaw all the branches within their reach; ſo that in a few days, where there are plenty of theſe animals, there may be ſuch deſtruction made among the young trees, as cannot be retrieved, but by cutting them down to the ground, which will be a loſs of ſeveral years; therefore thoſe perſons who have the care of young woods ſhould be very diligent in froſty weather in looking over the trees and ſtopping holes in the fences, to keep out all vermin.

Another care to be taken of young woods, is the thinning the trees from time to time, as they increaſe in their growth; but in doing of this, there muſt be great caution uſed, for it ſhould be gradually performed, ſo as not to open the trees too much, to let the cold air among them, which will greatly retard their growth; nor ſhould the trees be left ſo cloſe, as to draw each other up like Maypoles, but rather obſerve a medium in this work, cutting down a few each year, according as there may be neceſſity for it, being careful not to permit thoſe to ſtand, which may ſpoil the growth of the neighbouring trees, always obſerving to leave thoſe trees which are the moſt promiſing.

The young trees in theſe woods ſhould not be lopped or pruned, for the more they are cut the leſs they will increaſe in bulk; every branch which is cut off will rob the tree of its nouriſhment, in proportion to the ſize of the branch; therefore the hatchet ſhould not be ſuffered to come into young woods, unleſs in the hands of ſkilful perſons.

Where perſons have more regard to the future welfare of the timber than their immediate profit, the underwood ſhould be grubbed up as the trees advance, that the roots may have the whole benefit of the ſoil, and their ſtems enjoy the free air, without which their ſtems are generally covered

covered with mofs, and their growth greatly ftinted; as may be obferved in all fuch woods where there is any quantity of underwood remaining, in which places it is rarely found that the trees do ever grow to a large fize; therefore when large timber is defired, the trees muft have room to extend their roots and branches, without which it cannot be expected: but from a covetous temper, many people let their underwood remain as long as it will live; for as the timber increafes, the underwood will be gradually decaying by the fhade and drip of the large trees, fo that by this method the timber fuffers more in a few years than the value of the underwood; therefore by endeavouring to have both, neither of them can be fo good as where they are feparately preferved.

If perfons who have eftates would be careful to nurfe up trees in their hedge rows, it would in time become a fortune to their fucceffors; as hereby the timber growing in the hedges may be worth more than the freehold of the eftate, which has often been the cafe with eftates from which their poffeffors have cut down timber for fortunes for their younger children; the frequency of this fhould encourage perfons to be a little more attentive to the growth and prefervation of young woods, fince the expence and trouble is not great, and the future profit very certain; befides, the pleafure of feeing trees of a man's own fowing make yearly advances, muft be very great to thofe who have any relifh for country amufements.

There are feveral perfons who plant copfes for cutting every ten or twelve years, according to their growth. Thefe are ufually planted in autumn, either with ftools or young plants, which are drawn out of the woods; the latter fhould always be preferred to the former. Thefe copfes are commonly planted with feveral forts of trees, as oak, beech, chefnut, afh, birch, willows, &c. but the afh and chefnut are the moft profitable, where they grow kindly, becaufe the poles of afh are very valuable; thefe alfo are good for hoops, fo that there is no danger of having fale for thefe copfe woods when they are fit for cutting; but where the copfes are intended to remain, there fhould be no ftandard trees left for timber, becaufe as the heads of the trees fpread, and over-top the underwood, it will caufe that fo decay, and where the ftandards are left upon the ftumps of the copfe wood they will never grow to a large fize, nor will the timber be fo valuable as that produced immediately from a young root; therefore whoever will make the experiment, will be convinced that it is more for the advantage of both to keep them in diftinct woods.

But where perfons plant copfes upon land free from trees, it will be the better method to fow the feeds, efpecially if chefnut, oak, or beech, are the trees intended; for although it is a prevailing opinion with the generality of perfons, that by planting they fave time, yet I am fure of the contrary; for if the feedling plants are kept clear from weeds, they will, in eight or ten years, out-grow thofe which are planted; and thefe unremoved copfes will continue much longer in vigour than the other; fo that for either timber or copfe wood, the beft method is to prepare the ground well, and fecure the fences and fow the feeds, which is fo far from lofing, that in twenty years it will be found to gain time, which is what every planter wifhes to do.

The ufual time of felling timber is from November to February, at which time the fap in the trees is hardened; for when the fap is flowing in the trees, if they are cut down the worm will take the timber, and caufe it to decay very foon; therefore if the durablenefs of the timber is confidered, the trees fhould always be cut in the winter months; but as the bark of the oak is fo very valuable for tanning leather, there has been a law paffed to oblige perfons to cut thefe trees during the fpring-feafon, when the bark will readily peel off, by which the timber is rendered unfit for building either fhips or houfes, as it will be very fubject to caft, rift, or twine, and the worm will foon take it; therefore it would be more for the public benefit, if a law was enacted to oblige every perfon to ftrip off the bark of fuch trees, as are defigned to be cut down in the fpring, when the bark will run, leaving the trees with their branches ftanding till the following winter, which will be found to anfwer both purpofes well. *Miller's Gard. Dict.*

Wood-Cock *Soil*, ground whofe foil under the turf is of the colour of a wood-cock, and is not good.

Wood-Land, ground covered with woods. It is alfo a term ufed, by the farmers of many counties of England, for a fort of foil, from its conftant humidity and dark colour, refembling the foil in woods, which, of whatever nature it originally is, will always be made to appear thus from the continual dropping of trees, and the want of a free air and fun, together with the fall of leaves, deftroyed and wafhed to pieces by the wet.

This foil in the open countries has a confiderable quantity of clay in it, and holds the water a long time that once falls upon it: in wet weather it fticks firmly to the ploughfhare; and, in dry, is very apt to crack. In uncultivated places it ufually produces rufhes and rufh-grafs. A moift and dripping year is extremely detrimental to this fort of land.

WOODY, abounding with wood.

WOOL, the covering of fheep. Each fleece confifts of wool of feveral qualities and degrees of finenefs, which the dealers therein take care to feparate.

The Englifh and French ufually feparate each fleece into three principal forts, viz. 1. Mother-wool, which is that of the back and neck. 2. The wool of the tails and legs. 3. That of the breaft and under the belly. The wool moft efteemed is the Englifh, chiefly that about Leominfter, Coltfwold, and the Ifle of White; the Spanifh, principally that about Vegovia; and the French, about Berry.

An account of three experiments made to difcover whether wool, laid up in the fleece, alters in its weight.

It has been a matter of fome doubt amongft grafiers, farmers, and dealers in wool, whether or not wool, after it is fhorn and laid up in the fleece, alters in its weight. The following experiments were made to decide this queftion.

Experiment I.

This wool was fhorn dry, and laid up in a two-pair-of ftairs room, on a boarded floor.

	Weight lb.	oz.
1746, Aug. 10	76	6
Sept. 7	76	8
Oct. 14	77	11
Nov. 18	78	0
1747, Jan. 26	80	0
Feb. 20	80	4
Mar. 23	79	8
Apr. 18	77	13
June 24	76	8
July 28	76	8
Sept. 16	75	15
Nov. 2	78	1
Dec. 8	78	14
1748, Feb. 15	79	1

The weight was increafed from Auguft 10, 1746, (when it was firft laid up) to February 20, 1747, in the proportion as 100 to 105.

Experiment II.

This wool was fhorn dry, and laid in a lower room, with a brick floor one foot above the floor.

	Weight lb.	oz.
1746, Oct. 15	100	4
Nov. 18	101	2
1747, Jan. 26	102	8
Feb. 20	102	11
Mar. 23	102	9

The weight increafed from October 15, 1746, to February 20, 1747, as 100 to $102\frac{1}{2}$.

N. B. It is fomething difficult to account for this parcel of wool not encreafing more in its weight, as it lay fo near the ground floor; but very probably the air had been very damp and raw from the time it was fhorn till the 15th of October, 1746, when it was firft weighed, fo that the wool had then very likely gained weight confiderably.

Experiment III.

This wool was fhorn dry, and laid up in a two-pair-of-ftairs room, with a boarded floor.

	Weight lb.	oz.
1756, Aug. 30	36	9
Nov. 19	37	2
1757, Feb. 19	37	12
Mar. 24	37	6
April 1	37	4
D°. 21	36	14
May 2	36	13
June 1	36	$8\frac{1}{2}$
D°. 13	36	4
July 8	36	$1\frac{1}{2}$
D°. 27	35	12
Sept. 30	36	4
1758, Jan. 25	37	$11\frac{1}{4}$

The weight of this wool encreafed from the time it was laid up, Auguft 30, 1756, to February 19, 1757, as 100 to $103\frac{1}{4}$.

Both wool, and woollen rags, make an excellent manure. The rags should be chopped small, about an inch or two square, and scattered on the earth at the second plowing; for being thereby covered, they will begin to rot by seed time. They imbibe the moisture of dews and rain, retain it long, and, as Dr. Home observes, thereby keep loose soils in a moist state. They cost about fourpence a bushel at London, from whence many loads are sent every year to Dunstable (which is thirty miles), where they are laid even on stiff lands, just after the sowing of the corn, allowing to the acre four sacks of six bushels each.

WORMS are very prejudicial to corn fields, eating up the roots of the young corn, and destroying great quantities of the crop. Sea-salt is the best of all things for destroying them. Sea-water is proper to sprinkle on the land, where it can be had; where the salt springs are their water do; and were neither are at hand, a little common or bay-salt does as well. Soot will destroy them in some lands, but is not to be depended upon, for it does not always succeed. Some farmers strew on their lands a mixture of chalk and lime; and others trust wholly to their winter-fallowing to do it, if this is done in a wet season, when they come up to the surface of the ground, and some nails with sharp heads be driven into the bottom of the plough. If they are troublesome in gardens, the refuse brine of salted meat will serve the purpose, or some walnut leaves steeped in a cistern of water for a fortnight or three weeks, will give it such a bitterness that it will be a certain poison to them. A decoction of wood-ashes, sprinkled on the ground, will answer the same purpose; and any particular plant may be secured both from worms and snails by strewing a mixture of lime and ashes about its roots. It is a general caution among the farmers to sow their corn as shallow as they can, where the field is very subject to worms.

WORMS, a well known species of insects, very troublesome to horses.

Authors have described three different sorts of worms that affect horses, *viz.* bots, which young horses are often troubled with in the spring: the rotundi, or those resembling earth-worms; and the ascarides, or those about the size of the largest sewing needle, with flat heads.

For the method of curing the bots, *see the article* BOTS.

As the source of worms in general proceeds from a vitiated appetite and a weak digestion, recourse must first be had to mercurials, and afterwards to such things as are proper to strengthen the stomach, promote digestion, and by destroying the supposed ova, prevent the regeneration of these animals. Thus, two drams of calomel may be given with half an ounce of diapente, and mixed up with conserve of wormwood over night; and the next morning the above purge: these may be repeated in six or eight days. Or the following mercurial purge may be given, which will be less troublesome, and no less efficacious.

> Take crude quicksilver, two drams; Venice turpentine, half an ounce; rub the quicksilver till no glistening appears; then add an ounce of aloes, a dram of grated ginger, thirty drops of oil of savin, and a sufficient quantity of syrup of buckthorn to make a ball.

One of these balls may be given every six days, with the usual precautions in regard to mercurial physick; and these powders intermediately.

> Take powdered tin and Æthiops mineral, of each half an ounce: give every night in a mash, or his corn.

The various preparations of antimony and mercury must be given several weeks together, in order to get entire riddance of these vermin. The Æthiops mineral may be given to the quantity of half an ounce a day; the mercurius alkalisatus to two drams a day, incorporated with a bit of cordial ball. The cinnabar powders, as directed in the farcy, are no less effectual: and when worms are bred from high feeding, or unwholsome food; rue, garlick, tansy, savin, box, and many other simples, may be given successfully; being for that purpose mixed with their food; as also, cut tobacco, from half an ounce to an ounce a day.

As the generation of worms perhaps principally proceeds from a weak stomach, and bad digestion, if the horse be of a tender constitution, and a bad feeder, the following bitter drink should be given to strengthen his stomach, and mend his digestion; which will prevent the formation of these animals, interposing now and then a gentle stomach purge, prepared with an ounce and half of hiera picra made up into a ball, with syrup of buckthorn.

> Take gentian root, zedoary and galangals, of each two ounces; chamomile flowers, and tops of centaury, of each two handfuls; Jesuits bark powdered, two ounces; filings of iron half a pound; juniper berries four ounces: infuse in three gallons of ale for a week, shaking the vessel now and then: and give a pint of this night and morning.

To answer this purpose also, an ounce of filings of steel finely powdered, has been successfully given every day for a fortnight, or longer, in the horses corn. *Bartlet's Farriery, pag.* 150.

WOUND, a hurt given by violence.

In all fresh wounds made by cutting instruments, there is nothing more required than bringing the lips of the wound into contact by suture or bandage, provided the part will allow of it; for on wounds of the hips, or other prominent parts, and across some of the large muscles, the stitches are apt to burst on the horse's lying down and rising up in the stall; in such cases the lips should not be brought close together; one stitch is sufficient for a wound two inches long; but in large wounds, they should be at an inch or more distance; and if the wound is deep in the muscles, care should be taken to pass the needles proportionably deep, otherwise the wound will not unite properly from the bottom.

Should the wound bleed much from an artery divided, the first step should be to secure it, by passing a crooked needle underneath, and tying it up with a waxed thread: if the artery cannot be got at this way, apply a button of lint or tow to the mouth of the bleeding vessel, dipped in a strong solution of blue vitriol, styptic water, oil of vitriol, or hot oil of turpentine, powdered vitriol, or colcothar, &c. and remember always to apply it close to the mouth of the bleeding vessels, and take care that it is kept there by proper compress and bandage, till an eschar is formed; otherwise it will elude your expectations, and frequently alarm you with fresh bleedings.

In a memoir presented to the Royal Academy of Sciences by M. La Fosse, he gives an account of the success he had met with, in stopping the bleedings of very considerable arteries in horses, by the application of the powder of puff balls, the arteries cicatrizing by this means only, without any succeeding hæmorrhage. This lycoperdon, or puff ball was made use of for this purpose in human subjects, about one hundred and sixty years ago, by Felix Wurtz, a famous old surgeon in Germany; but he does not seem to have a thought of trusting to it in such considerable arteries, as M. La Fosse mentions, viz. those of the leg and thigh, the bleedings from which divided vessels, he stopt in a few minutes by the use of this powder only. The agaric of the oak may also be used for this purpose, where it can be retained by a proper bandage.

These applications, as indeed all styptics, seem to act by constringing the extremity of the vessel, or choaking it up, till a grume of blood is formed internally, which plugs up the orifice; and has been found to adhere to it so, as to constitute one body with the vessel. M. La Fosse has proved this by slitting an artery up longitudinally, when he found, that the little grume of clear blood, was of a firm consistence, of a lively red, in form of a cone or sugar loaf, the basis of which adhered to the little inclosing membrane, which shut up the artery without; the pocat of which floated in the cavity of the vessel.

I purposely avoid setting down any famous receipts for fresh wounds, whether ointments, or Fryar's balsams, being well assured, that in a healthy sound constitution, nature furnishes the best balsam, and performs herself the cure, which is so often attributed to the medicine; when it is otherwise, and the blood is deprived of its balsamic state, as will appear from the aspect of the wound, and its manner of healing, it must be rectified by proper internal medicines, before a good foundation for healing can be laid by any external applications whatever.

The lips of the wound then being brought together by the needle or bandage, it needs only to be covered with rags dipped in brandy, or a pledgit of tow spread with the wound ointment, and the wounded part kept as much as possible from motion.

Remember to dress all wounds of the joints, tendons, and membranous parts, with terebinthinate medicines: to which may be added honey and tincture of myrrh; and avoid all greasy applications whatever; fomentations and poultices are also generally here of great use; the former thin and attenuate the impacted fluids, greatly promote a free perspiration in the limb, and facilitate the unloading the surcharge on the vessels, by quickening the motion of the fluids; while the latter, by relaxing the vessels, abate their tension, and relieve the obstruction, by promoting digestion.

Punctured wounds from thorns, or any other accidents, should be treated in the same manner; applying the beer, or bread and milk poultice over the dressing, till some signs of digestion appear; and fomenting the part well every day. This method is also very successfully used to those swellings, which often arise on the neck from bleeding, the sores being sprinkled with precipitate, and burnt allum powdered, to fetch out the core, or fungus, which choaks up the orifice. The usual method is to introduce a piece of vitriol, or sublimate, which often brings on a plentiful discharge, fetches out the core, and makes a cure; but it is often with the loss of the vein, and it sometimes leaves a large swelling and imposthumation.

In gun-shot wounds, when the ball has not penetrated too deep, it should be extracted, if it can be fetched away without disturbance, together with any extraneous bodies that might pass in with it; the wound should be dressed with the old digestive of Venice or common turpentine, divided with the yolks of eggs, to which may be added some honey and tincture of myrrh. The entrance of these wounds frequently requires to be enlarged, and a depending orifice should always be procured if possible; and if the wound should not digest kindly, apply the beer poultice, and foment with the discutient fomentation.

In scalds, or burns from gunpowder, or any other cause, when the skin remains intire, bathe the part well, and keep it soaked with rags dipped in spirit of wine camphorated: salt bound thick on the part has been found very effectual for this purpose: and indeed all saline and spirituous applications excel others, while the skin is yet unbroke; but when the skin is separated, anoint the part, and keep it constantly supple with linseed or sallad oil, and a plaister spread with bees-wax and oil; if the skin is so scorched, that sloughs must be digested out, dress with the wound ointment and oil of turpentine, and finish the cure with any drying ointment. Should the horse be feverish from the pain, bleed him, give cooling glysters, and treat him as we have directed in simple fevers.

The fire supposed to be left in the part after injuries of this kind, is nothing more than the inflammation, which is the natural effect of such causes; so that the whimsical notions and conceits concerning fire remaining in the burnt part, is extremely absurd.

Wounds in the feet from nails, gravel, &c.

Accidents of this sort are very common, and sometimes for want of early care, prove of bad consequence; for the parts being naturally tender, are very susceptible of inflammation; and when matter is once formed, if a free discharge is not procured, the bone, which is spongy, soon becomes affected, and the whole foot is then in danger.

When any extraneous bodies, such as nails, stubs, thorns, &c. have passed into the horse's foot, you should endeavour to get them out as soon as possible; and after washing the part with oil of turpentine, dress the hole with lint dipped in the same, melted down with a little tar; the foot may be stopped up with bran and hogs-lard heated together, or put it into the turnep, or any soft poultice: this method is generally succesful, when the nail, &c. is intirely removed; but if any piece, or particle, should remain behind, which may be suspected by the degree of pain, and discharge of matter; after paring away the sole as thin as possible, introduce a bit of sponge tent, in order to inlarge the hole, that it may be drawn out by a small pair of forceps, or brought away by digestion: if this method should not succeed, but the lameness continues, with a discharge of a thin, bloody, or stinking matter, you must no longer delay opening the wound with a drawing knife to the bottom, and then dress as above directed, or with the turpentine digestive, divided with the yolk of an egg, and a little tincture of myrrh afterwards with the precipitate medicine. *Bartlet's Farriery, pag.* 246.

Y

Y.

YARD-LAND, a quantity of land, in some countries fifteen acres, in some twenty, and in others, twenty-four, thirty and thirty-four acres.

YELLOWS, a disease incident to horses and other cattle, and more properly called the jaundice. *See the article* JAUNDICE.

" Having, says a correspondent of the editors of the Museum Rusticum, noted the frequent fatal effects of the disease in cattle, called the yellows, I, some years since, resolved to let no opportunity slip of being acquainted with this complaint, in order to assign its cause, inasmuch as I apprehend it to be the forerunner of most chronical diseases, to which great cattle are subject, as the murrain in the guts, scowering, asthma, or wheezing, dropsy, and loss of milk, &c.

" I have not hitherto been able to find any author who has treated of this complaint in a manner suitable to the consequence thereof, so as to trace the symptoms in its several stages, in order to effect a cure; and, where this complaint has been quite neglected or ill cured, to point out the consequence, by shewing how it may appear under the abovementioned shapes, which, being mistaken for originals when they are only consequents, are rarely cured, through the first cause being unknown.

" This complaint, I apprehend, proceeds from a waste of bile, that is, a preternatural running out of what is called gall; occasioned by the rugæ, which are in the inner membrane of the neck of the bilious duct, becoming, by some accident, too weak to perform their office, so that the gall runs out of the bladder nearly as fast as it runs in; by which means it forceth itself, or a considerable part at least, into the porus bilarius, instead of being discharged by the ductus communis cholidochus into the intestines, and, by the means of the vena porta, mixes again with the blood, filling that with its sharp pungent quality; which causeth that fluid to become of a sizy nature, and, consequently, to move slowly in the channels through which it passes; whence arises that sluggish disposition the beast in this complaint is subject to, and which is one of the first symptoms of the disease.

" And the liver, being deprived of the natural heat and weight thereof, is, together with the siziness of the blood, rendered incapable of performing its office, so that the supply of bile is not equal to the expence; nor is the blood purified from it as it ought, but passes on together till it fixes in some part, and there (if not timely prevented) forms a tumor very prejudicial to the beast.

" These tumors I have seen appear externally in the glands behind the ears, of the shoulders, and of the flank, in the dewlap, round the cornet of the hoofs, and in the udder, or milk-bag; internally, in the form of water, in the veins of fat between the muscular parts of the body, in the kidney fat, and even between the coats of the guts.

" When these tumors, which appear externally, come to suppuration, the beast commonly recovers, though frequently it be a long time first.

" The seasons of the year in which cattle are most subject to this complaint, are for about the five first weeks after they are put out to grass in the spring, during which time the season is apt to be very warm at days and cold at nights; the grass being also tender, and abounding with moisture: and, in like manner in autumn; at which time the days are also warm and nights cold; and the grass, on account of autumnal rains, tender as in the spring, and more so, if the preceding summer was tolerably dry.

" The cattle at these seasons being faint are very subject to perspire much, by which the pores are greatly opened in the day, and sudden cold coming on at night hastily contracts them; and before the warmth of the next day becomes sufficient to set the parts thus contracted at liberty, the matter, which should have been discharged by perspiration, returns into the blood in order to pass off by urine, by which means a much greater quantity of bile is secreted than otherways would; which passing into its receptacle, the gall-bladder, causes it to extend to a preternatural size; thereby extending the passage by its pressure, till the rugæ are scarcely to be seen: whereby the resistance made by them is not equal to the pressure of the bile, which, consequently, forces its way hastily into the blood, in the manner before observed, instead of passing off as excrement by the guts.

" The early symptoms attending this disease, are, a shaking of the beast in a morning, and more particularly the hinder parts, as the loins, thighs, and legs; hollowness of the eyes, and the hair staring; a dry nose, and if the cold taken be great, hanging of the ears, the swelling of the dewlap, of the glands of the ears, the shoulders, or the flanks, and of one or more quarters of the udder, or milk-bag in cows; with a sudden decrease of milk, what remains becoming, after a few days, more yellow than usual, and will, if boiled, curdle: the fore teeth are generally loose, as though they would drop out.

" If these symptoms, especially the first, remain unobserved, as is often the case in barren cattle, and such as range at large, it frequently happens that the disorder settles in some inward part; as on the pericardium, which causes wheezing, and the hask, and uncommon poverty; when in the guts and mesentery, (or sweet-bread) causes the lask and scowering; and when in the vein of fat, between the muscles, causes the dropsy and uncommon weakness.

" In this last complaint, on opening a beast, the melt or spleen was very small and thin, not half so large as in a healthy state, as was also the liver; but otherways found and perfect, the gall-bladder of an uncommon thickness, and its contents very little.

"In opening a beaſt which was waſted, and ſubject to wheezing and the haſk, the pericardium was become hard, and inclined to calloſity towards the part which joined the heart: the heart unuſually large, but ſound: the lights very ſound, but ſmall: the melt or ſpleen thin and withered: and the liver dryiſh, with a few ſmall hard knots therein: the gall-bladder near as the former.

"I have obſerved theſe knobs in others, and generally found the gall-bladder, liver, and ſpleen, leſs or more affected; thoſe which had the laſk, and ſcowered, generally having their guts covered, the inſide with a large quantity of mucus reſembling frogs ſpawn: the fleſh of theſe is always of a yellow caſt.

"Having ſaid thus much of what I apprehend the cauſe, I will now preſcribe what I have very many times known uſed with good ſucceſs for a cure.

"Firſt, Suffer no blood to be taken away from the beaſt.

> "Take a handful of rue tops, the like quantity of the greater celendine; ſhred them ſmall, and mix with them one ounce of turmerick root in powder (or inſtead thereof red ſanders); put theſe in three pints of ſtale old ale or beer, and cauſe it juſt to boil up; when it is cold enough, give it the beaſt warm: there is no occaſion to keep the beaſt in before or after, unleſs the inclemency of weather oblige.

"Two of theſe drinks, at forty-eight hours diſtance, will perfect a cure, if the diſeaſe be not of long ſtanding.

"Should a ſcowering be come on, then, after the firſt drink, give the following on the intermediate days.

> Take two pounds of oak-bark, boil it in one gallon of water till one fourth be conſumed; ſtrain it; in this water boil two pounds of rice till it be ſoft; mix with it half a pound of the burnt cruſt of bread, taken from the underſide of the loaf; and to all this put two quarts of milk; let it boil for twenty minutes; divide it in two parts, and give one to the beaſt at a time warm." *Muſeum Ruſticum, vol.* II. *pag.* 144.

YEOMAN, the firſt, or higheſt degree of the plebeians of England. The yeomen are properly freeholders, and who cultivate their own lands.

YEW-TREE, the name of a well known tree, common on cold ſoils in many parts of England. The timber of the yew-tree is much eſteemed for various uſes.

There is hardly any ſort of ever-green tree, which has been ſo generally cultivated in the Engliſh gardens as the yew, upon the account of its being ſo tonſible, as to be with eaſe reduced into any ſhape the owner pleaſed; and it may be too often ſeen, eſpecially in old gardens, what a wretched taſte of gardening prevailed formerly in England, from the monſtrous figures of beaſts, &c. we find theſe trees reduced into; but of late this taſte has been juſtly exploded by perſons of ſuperior judgment; for what could be more abſurd than the former methods of planting gardens? where, thoſe parts next the habitation were crouded by a large quantity of theſe and other ſorts of ever-green trees, all of which were clipped into ſome trite figure or other, which beſides the obſtructing the proſpect from the houſe, filled up the ground; ſo that little room was left for other ſhrubs and flowers. Beſides, it occaſioned an annual expence to render the trees diſagreeable; for there never was a perſon who had conſidered the beauty of a tree in its natural growth, with all its branches diffuſed on every ſide, but muſt acknowledge ſuch a tree infinitely more beautiful than any of thoſe ſhorn figures ſo much ſtudied by perſons of a grovelling imagination.

The only uſe this tree is fit for in gardens, is to form hedges for the defence of exotic plants; for which purpoſe, when it is neceſſary to have hedges, it is the moſt proper of any tree in being; the leaves being ſmall, the branches are produced very cloſely together; and if carefully ſhorn, they may be rendered ſo cloſe, as to break the winds better than any other ſort of fence whatever, becauſe they will not be reverberated, as againſt walls, pales, and other cloſe fences; therefore conſequently, are much to be preferred for ſuch purpoſes.

Theſe trees may be eaſily propagated by ſowing their berries in autumn, as ſoon as they are ripe, upon a bed of freſh undunged ſoil, covering them over about half an inch thick with the ſame earth.

In the ſpring the bed muſt be carefully cleared from weeds, and if the ſeaſon prove dry, it will be proper to refreſh the bed with water now and then, which will promote the growth of the ſeeds; many of which will come up the ſame ſpring, but others will remain in the ground until autumn or ſpring following; but where the ſeeds are preſerved above ground till ſpring before they are ſown, the plants never come up till the year after, ſo that by ſowing the ſeeds as ſoon as they are ripe, there is often a whole year ſaved.

Theſe plants, when they come up, ſhould be conſtantly cleared from weeds, which, if permitted to grow amongſt them, would cauſe their bottoms to be naked, and frequently deſtroy the plants when they continue long undiſturbed.

In this bed the plants may remain two years; after which, in autumn, there ſhould be a ſpot of freſh undunged ſoil prepared, into which they ſhould be removed the beginning of October, planting them in beds about four or five feet wide, in rows about a foot aſunder, and ſix inches diſtance from each other in the rows, obſerving to lay a little mulch upon the ſurface of the ground about their roots, as alſo to water them in dry weather until they have taken root; after which they will require no farther care, but to keep them clear from weeds in ſummer, and to train them according to the purpoſe for which they are deſigned.

In theſe beds they may remain two or three years, according as they have grown, when they ſhould again be removed into a nurſery, placing them in rows at three feet diſtance, and the plants eighteen inches aſunder in the rows, obſerving to do it in autumn, as before directed, and continue to trim them in the ſummer, for what they are intended; after they have continued three or four years in this nurſery, they may be tranſplanted where they are to remain, always obſerving to remove them in autumn where the ground is very dry; but on cold moiſt land it is better in the ſpring.

Theſe trees are very ſlow in growing, but yet there are many very large trees upon ſome barren cold ſoils, in divers parts of England.

YOAK, *or* YOKE, a frame of wood, fitted over the necks of oxen, whereby they are coupled together, and harneſſed to the plough.

Horſes and oxen are the animals uſed for drawing ploughs. Sometimes the one, ſometimes the other, and ſometimes both together. It is impoſſible to determine which of theſe is the moſt proper. This depends upon the kind of food moſt eaſily obtained, the other kinds of work required, and the expenſe of breeding, or purchaſing. If the real labour is to determine this without any other conſideration, then oxen are to be preferred; becauſe as they ſtand to the draught, they will overcome a reſiſtance which horſes will yield to.

As it cannot be determined, what kind of cattle are moſt proper for the plough; ſo neither can it be determined, what number is neceſſary. This depends upon the ſtrength of the cattle, and the nature of the ſoil. The number varies according to the work in which the plough is to be employed, and often according to the cuſtom of the place, and fancy of the farmer.

The methods of yoking cattle in ploughs vary almoſt as much as the number uſed. Some of them at firſt ſight are ſo aukward, that it is needleſs to conſider them. The only thing worthy of being inquired into, is, whether the cattle ſhould be yoaked in pairs, or in a line before each other? We ſhall therefore conſider the advantages and diſadvantages attending each way, and compare them together.

The moſt common way of yoaking cattle in ploughs is in pairs. There are ſome diſadvantages attending this way that are obvious. In ploughing the furrows betwixt ridges, the land-cattle go upon the ploughed land, and tread

tread it down with their feet: this, eſpecially if the land is wet, hurts it very much.

There is another diſadvantage very obvious. When there is but as much of the ridge unploughed as to allow the land-cattle to go upon it with difficulty, they are frequently either going into the oppoſite furrow, and thereby giving the plough too much land; or, which is worſe, they are juſtling the furrow-cattle upon the ploughed land.

To remove theſe inconveniencies that attend the ploughing with cattle yoked in pairs, ſome yoke them in a line before each other. It is obvious, that cattle yoked in this manner, going always in the furrow, neither tread upon the ploughed land, nor joſtle one another. In theſe reſpects the yoaking the cattle in a line before each other, ſeems to have the advantage.

It is to be obſerved, however, that this method is not quite free from inconveniencies. When examined, it may perhaps be found attended with as great inconveniencies as the other.

When cattle are yoked in a line, they go all in the furrow. This makes it neceſſary to give the plough more land and than ordinary, either by the ſoke or the muzzle: for if this is not done, the head and ſoke being in the ſame direction with the beam, and the cattle yoaked to the middle of it, the plough will directly follow the cattle, without taking any thing off from the land. Now, it is inconvenient to be obliged to give the plough land either by the ſoke or muzzle; for, when the ſoke is turned out of the plane of the beam, it makes the plough heavy to draw; and when the muzzle puts the draught too much to one ſide of the beam, it prevents the plough from going upright. The yoking the cattle in pairs is attended with none of theſe inconveniences: for, in this caſe, the quantity of land, which the plough has naturally, when right made, is ſufficient to make it take off a proper furrow.

There is another inconveniency that attends yoking cattle in a line, ariſing from the nature of the animals. Horſes and oxen, like men, love their eaſe, and are diſpoſed to throw the burden upon their fellows. This they have a better opportunity of doing when yoked in a line before each other, than when yoaked in pairs. When yoked in a line, each pulls by the traces of the one behind him; and therefore, though it may be known when the foremoſt neglects his work, by the ſlackening of his traces, yet it cannot be known when any of the reſt neglect their work; for though one of them does this, yet by the pulling of the one before him his traces may be fully ſtretched. But this is eaſily diſcovered, when the cattle are yoked in pairs; for then every one of them has a ſeparate draught. The goadman or driver knows, by the poſition of the yokes or croſs-trees, whenever one of them does not draw equally with his fellow; and the ploughman perceives, by the going of the plough, whenever any of the two pairs does not draw equally with the other: for if the pair that goes foremoſt neglect their work, the plough is pulled out of the ground; and if the pair that go hindmoſt neglect their work, the plough is pulled in too deep. The reaſon is obvious; the plough is made to go at a proper depth, when the two forces by which different directions are given the plough, act at the ſame time. If one of them then ſhould ceaſe to act, the plough cannot go right. If the foremoſt pair ſhould ceaſe to draw, the plough having too little eard for the direction of the draught of the hindmoſt pair, will come out of the ground: and if the hindmoſt pair ceaſe to draw, the plough having too much eard for the direction of the draught of the foremoſt pair, will go in too deep. This does not hold in an ox-plough: for as the ſoam by which the foremoſt pair draw is fixed to the yoke of the hindmoſt pair, the whole force applied to the plough is in the ſame direction; and therefore, though any of the pairs ceaſe to draw, there is no alteration in the going of the plough.

There is yet another inconveniency that attends the common way of yoaking cattle in a line before each other. When the fore cattle are all yoked to the traces of the hindmoſt, it is obvious, that as the beam, to which the draught is fixed, is much lower than his ſhoulders, by which the reſt pull, ſuch a weight muſt be laid upon his back or ſhoulder, as muſt render him incapable of giving any aſſiſtance. Beſides, as the whole force is applied in the direction of the traces of the hindmoſt horſe, it cannot have ſuch influence on the plough, as when a part of it is in a direction more horizontal. When a body is to be moved forward in any direction, the nearer that the direction of the force applied approaches to the direction of the body, it acts with the greater influence. And therefore, as the plough moves horizontally, and as the direction of the united draught of a plough with the cattle yoked two abreaſt, is more horizontal than the direction of the draught in a plough with cattle yoked in a line, the ſame force applied will have greater influence.

When theſe two different ways of yoking cattle in ploughs are thus conſidered and compared together, it is difficult to determine which ought to be preferred. Each of the two ſeems preferable to the other in a certain ſituation. When the land is ſtiff and the labour ſevere, the yoking the cattle in pairs ſeems preferable, as it is certainly the ſtrongeſt draught; and when the land is wet, and in danger of being much hurt by the treading of the cattle, the yoking them in a line before each other ſeems preferable; as thereby they are confined to the bottom of the furrow, which is the firmeſt part of the land, and prevented from doing harm.

When a perſon uſes two or more ploughs, it is a very proper way to have one with the cattle yoked in a line, and the reſt with the cattle yoked in pairs. The ploughs with the cattle yoked in pairs continue as long as the land-cattle have room to go eaſily upon the firm land; and the plough with the cattle yoked in a line, follows, and clears up the furrows. In this way the cattle yoaked in pairs do no damage, and the cattle yoaked in a line are never uſed but where they are of real benefit.

To perſons that incline to yoke the cattle in a line before each other, it will not be amiſs to point out a way to remove the inconveniency laſt mentioned, and ſhow how the cattle may be yoked ſo as to lay no additional weight on the back or ſhoulders of the hindmoſt horſe, and to make the direction of the draught more horizontal. This is done by making the traces of the horſe next to the plough but one very long, and fixing them, not to the ſhoulders of the horſe behind him, but to the croſs-tree, and by fixing the traces of the horſe before him, not to his ſhoulders, but to his traces at the place where the back-rope is fixed. By this the hindmoſt horſe is delivered from the burden laid upon him in the other method, as his draught is entirely independent of that of the reſt. There is indeed ſome weight laid upon the horſe immediately before him, to whom the others are yoked. But this is but ſmall; for his traces are nearly in the ſame direction with theirs, and they are yoked to him at a place lower than his ſhoulders. By this, likewiſe, the direction of the united draught is more horizontal, when there are three or more horſes yoked; it is even more horizontal than when the cattle are yoked in pairs. In a four-horſe plough yoked in pairs the two forces are equal; but in a four horſe-plough, yoked in this manner, the force moſt horizontal is to the other, as three to one.

The traces of the horſe hindmoſt but one being long, will incommode the hindmoſt horſe in turning, if they have nothing to ſupport them. To prevent this, two links muſt be fixed to the ſhoulders of the hindmoſt horſe, and the traces paſſed through them; the links long enough to allow the traces to be ſtretched.

When two horſes are ſufficient for the draught, the yoking them in this manner deſcribed for the two hindmoſt, removes alſo the ſecond inconvenience mentioned, that attends the yoking the cattle in a line: for the ploughman diſcerns, by the going of the plough, when any of them neglect their work, in the ſame manner as when there are four horſes in the plough yoked in pairs

The ordinary method of yoking oxen, is attended not only with all the inconveniencies of yoaking cattle in pairs, but alſo with the laſt-mentioned inconveniency, of yoking cattle in a line. For the ſoam, by which the foremoſt cattle draw, is fixed to the yoke of the hindmoſt pair. Their yoke being higher than the beam, a great weight is laid upon their necks by the drawing of the foremoſt cattle. This inconveniency may be removed, and the oxen yoked

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in such a manner, as to give two directions to the plough, as is done when horses are yoked in pairs; by which the draught will likewise be made stronger. To do this, the soam of the pair immediately before the hindmost must be fixed, not to their yoke, but to the beam; and, to prevent this soam from incommoding the hindmost in turning, a link must be fixed to their yoke for it to pass through, the link long enough to allow the soam to be fully stretched. When there are more than two pair in the plough, as is most common, the largest-sized cattle should be placed next the plough, and the smallest-sized immediately before them. For the lower that the yoke of these last is placed, the nearer will the direction of their soam be to the soam of those before them; and thereby the less weight laid upon their necks. This method of placing the cattle is contrary to the ordinary way: for it may be observed, that the smallest-sized oxen are always placed next to the plough. But these different ways of placing the cattle are both founded upon the same reason: for the smallest-sized oxen are placed next the plough in the ordinary way of yoking, that so their yoke, to which the soam of the pair before them is fixed, may be as low as possible: for the lower that it is placed, the nearer the directions of the two soams approach each other, and the less weight is laid upon the necks of the hindmost pair. And, for the same reason, the lowest-sized oxen should be placed in the middle, when yoaked in the manner proposed, that so they may be less incommoded by the pair before them.

If, in considering the most proper method of yoking cattle in ploughs, we had nothing in view but the strength of the draught, and conveniency of the cattle; we would always recommend the yoaking the cattle in such a way, as to apply two forces to the plough in different directions. But as we must also have in our view the going of the plough, hence it becomes necessary to observe, that sometimes it is an advantage, to have the draught of the whole cattle in the same direction.

In ploughing lea, where the sward is tough, or any kind of land, where there are interruptions from roots, or the hardness of the bottom; the plough, if two forces are applied to it in different directions, goes very unsteadily, sometimes too deep, and at other times too shallow; and is very difficult to manage. The reason is obvious: when the plough meets with such interruptions, as tend to make it go deeper, or shallower, than its ordinary way of going; if at the same time, the force that acts contrary to the interruption ceases; then the plough, in spite of all the attention of the ploughman, will either start out of ground, or go in too deep, according to the tendency of the interruption. But when there is only one force acting upon the plough, it is, in some respect, like the wheeled plough; it goes steadily, and at a certain depth; at least, it is not so difficult to manage it, as when there are two forces acting in different directions: for though some of the cattle, at the time when the interruption is given, should cease to draw, yet the draught continues still in the same direction, and the ploughman has only the alteration occasioned by the interruption, to rectify. Every person knows, that an ox-plough goes much more steadily than a horse-plough: and this is occasioned, not only by the nature of the animals, oxen being more steady in drawing than horses; but also by the manner of yoking them, oxen being yoked in such a manner, as that one force only is applied to the plough.

Thus it apppears, that no absolute determination can be given, which of these two ways of yoking cattle in ploughs is to be preferred. Men must weigh the advantages and disadvantages attending each way, and determine according to circumstances. If the land is of a kind not easily ploughed, the cattle not well trained, and the ploughmen not expert, the work will be best performed, if there is only one force applied to the plough. But if the land is easily ploughed, that is, has few things in it to incommode the plough in going; if the cattle are well trained, and the ploughmen expert, the work will be well enough performed, and the labour less severe upon the cattle, if two forces are applied to the plough in different directions.

YOAK *of land*, the quantity of land which a yoak of oxen might plough in a day.

F I N I S.